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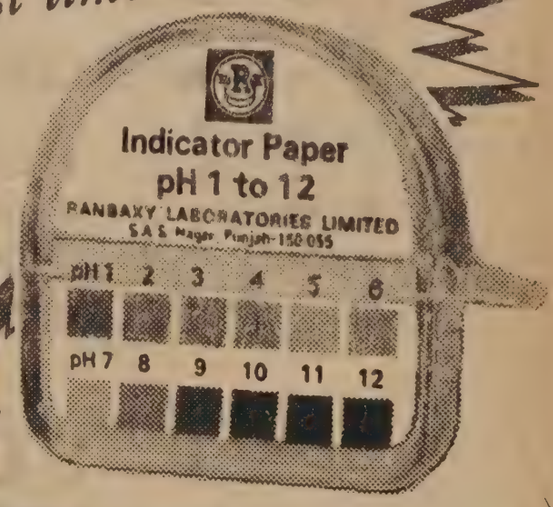

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CHEMICAL WEEKLY

VOL. XXXV JANUARY 2, 1990 NO. 17

HERALDING THE 21st CENTURY - 33

A Seer's Catalogue

Looking into the future is often like venturing into unexplored territory. It creates exhilaration along with the feeling of uncertainty. The American Futurology Journal *OMNI* interviewed leaders in the field of science, economics, politics, art, education and communication regarding their views as to what changes one can expect in the next three decades in their field of human endeavour. Every one was agreed the world is on the threshold of startling changes.

Whatever judgement one may pass on any particular analysis, projection, or revelation, it is clear that the times are ripe for all sorts of startling changes. In America in the year 2007, various experts tell us, we are promised polymorphous perversity, peace in the Middle East, babies born of artifical wombs, and life in ten dimensions. And we will have a chance to unite body, mind, and spirit such as we have never had before.

Bill Gates, Chairman of the Board, Microsoft Corporation: The processing of digital information is improving very quickly. In ten years you'll have 30 to 40 times as much computational power, and sounds that you now receive just passively from TV — you'll insert yourself into a game or even change the outcome according to your wishes. So in 20 years your ability to get information will be expanded exponentially.

In 20 years the information Age will be here, absolutely. The dream of having the world database at your fingertips will have become a reality. You will have stored very high-level representations of what the sun looks like or how the wind blows.

Also, we will have serious voice recognition. I expect to wake up and say, "Show me some nice Da Vinci stuff," and my ceiling, a high-resolution display, will show me what I want to see — or call up any sort of music or video. The world will be online, and we'll be able to simulate just about anything.

A lot of things are going to vanish from our lives. There will be a machine that keys off on physiological traits, whether it's voiceprint or fingerprint, so credit cards and checks — pretty filmsy deals anyway — have got to go. Passive entertainment will disappear. People want to get involved. It will really start to change the quality of entertainment because it will be individualized.

People will like the idea that the machine really knows them and that the machine can create experiences formed around the events in their lives to fulfil their particular needs and interests. But there's a danger too. It will be easy to feel worthless or overwhelmed by the amount of data. So what we'll have to do is make sure the machine can tailor the data to the individual.

Probably all this progress will be pretty disruptive stuff. We'll really find out what the human brain can do, but we'll have serious problems about the purpose of it all. We're going to find out how curious we are and how much stimulation we can take.

Take the change in movies in the last few years. Just a few years ago you had to find out where the movie was playing, then go to a certain neighbourhood and stand in line to see the movie. Now you can go two blocks and find 10,000 titles. You feel inadequate. It's going to be intimidating.

But in the next 20 years you won't be able to extrapolate the rate of progress from any previous pattern or curve because the new chips, these local intelligences that can process information, will cause a warp in what it's possible to do. The leap will be unique. I can't think of any equivalent phenomenon in history.

Tony Verna, President, Global Media: Director of Live Aid and Sport Aid, Inventor of Instant Replay: I can tell you step-by-step what's going to happen. We'll have high-definition TV with a wide screen of, say, 1,125 lines rather than the conventional 525 lines. And the aspect ratio on your set will be five-to-three, not four-to-three. The resulting images will rival 35 mm film in quality. These sets will be wallprojection units, either liquid-crystal disc players or the familiar cathode-ray tubes, without their current depth. You'll see this first in public places like bars — wide screens with beautiful pictures of football games and so on. All this will happen very soon, probably about 1990.

Shortly after that, we'll have digital TV and the viewer at home will become a participant in the actual production. He'll play director. He'll switch cameras himself to look at the game from different views. By then tapes will be so small they'll be like little balls of thread on your TV set, and you can have them taping the end zone while you are watching the 50-yard-line camera.

There will also be a truer form of 3-D television, one with no TV set. You'll wear a pair of glasses, and each lens will have its

own little TV set. Separate liquid-crystal screens will be built into the pair of glasses. The screens will be translucent so that if the tea kettle boils and you have to move to the stove, you'll be able to see through them. You won't feel claustrophobic.

Then there will be no TV — not even on your eyes. The images you'll watch will be projected by lasers. There will be three laser beams, and each beam will cover the red, blue, and green spectrums. The image will appear in your living room, without a screen, wherever these three beams actually converge — where they hit is where the image will appear. The next step will be a molecular digitizer of ions. You'll need an ion camera, not laser beams, to pick up the image. The camera will pick up signals that are bounced off the invisible part of the light spectrum. You won't have a TV set but a positive and negative grid in your ceiling and floor. When these rays come into the ion chambers the images will form.

The next innovation, Sensavision, will be like a Walkman attached to your forehead. You won't actually have your head wired because infrared wires will send signals to you. In 2007 Mick Jagger will be onstage, and when Mick feels heat, you'll feel heat. If a spray of water hits Tina on the back, you'll feel that, or you'll switch to the stands and smell what people are smoking. There probably will have to be a computer cutoff point to prevent the emotional sensations from getting too intense, especially for sex scenes or if you're watching a car race when the race-car driver crashes.

The viewer will be able to conquer time and space with the tube. Someday the director's and producer's jobs will end in the control room, and the viewer's job will begin. With laser vision, you are going to walk around in the scene. With Sensavision, you'll be able to feel the thrill of victory or the agony of defeat. All this will change the world. The ability to communicate — that's what it's all about. Twenty years from now we certainly should have more empathy and compassion for each other. And that's without a world leader putting Sensavision on his forehead to feel what it's like for someone else.

William McGowan, Chief Executive Officer, MCI Communications Corporation: Information will be a kind of international standard, the way we now think of gold. It is going to be a controlling factor in international trade. At MCI we are now trading 24 hours a day. Most companies will be trading 24 hours a day in just a few years. You won't hear that clanging bell when the market stops. It's going to be a continuum because information is that way. I can reach any information I could possibly use in a few seconds with my little PC — whether it's commodities, news, or a search.

People are worried about information overload, but that's a copout. They're just not sure they can become part of the process because you can get the information in the manner you want, in the form you want, and at the moment you want. So you control the process. It's going to be fantastic. For example, in Washington six universities are going to combine their libraries of rare books. When you realize that a compact disc — a four-and-a-half-inch disc — can contain the same amount of information as 11,000 floppy disks, you say to yourself, Hmm, maybe this is going to be interesting. And we still have in the cost of computing power using today's technology. Then we may have to figure out how to compute using chemical reaction. Probably the best guess is light for computing power. Just look at what is hapening now in fiber. I'm convinced we will have 1.6 gigabits per fiber within two years. That's 50,000 voice channels per fiber, with a fiber that's thinner than a human hair. Can you imagine the value, the economies that are going to come out of telecommunications and computing power 20 years from now?

Timothy Leary, President, Futique St. ware Company: B
2007 the problem of scarcity will be solved. Because most wor
will be done by robots and computers, you won't have to wor
Material possessions won't mean as much to us as they do no
If there are nine Porsches in your garage, you're going to say, "Tak
them away". We've done that with wheat and grain, and we ca
do it with other things if we put our minds to it. The way we defin
human beings will change. You won't be a serf, a slave, or a worke
What will you be? A performer. Everyone will be performing. Pas
sive listening, passive observing, passive watching will disappea

In 2007 you'll be living in an information society in which infor
mation will be what money and machinery were in the Industria
Age. Everyone is going to be a psychologist, computer whiz, phi
losopher. Mind play, mind performance, psychological skill are goin
to be the equivalent of land, money, and power in the earlier ages
Now to the nuts and bolts of this stuff. Every kid will learn how
to communicate at a very young age; every kid will have his own
computer — like a pair of sneakers, a pair of Nikes. No one wil
steal a computer, because you'll throw them away. And everyone
will learn how to chart his thoughts and his mental performance
— like a baseball player's stats. Even kids will plot their thought
like they plot their batting average. The name of our species is Homo
sapiens. That means we're the organism that thinks, and our spe-
cies finally will be proficient in thinking.

Within 20 years we'll have scrapped the current system of par-
tisan politics. Partisan politics belongs back in an age of feudalism,
or at most the industrial Age. It is insane to run a highly compli-
cated; technological, pluralistic society like America when you have
in the cabin of the spaceship a Democratic and a Republican can-
didate kneeing and gouging and beating up each other to see who's
going to be president for four years. In an electronic society an intel-
ligent person would no more send Tip O'Neill to Washington to
make his laws than you'd send Tip O'Neill to the wine shop to pick
out a good wine for you. Everyone is going to be responsible for
government. It will be done by televoting, perhaps every Sunday
between, say, twelve and one. But we'll be voting on major issues
— not parties, people, or a glamorous candidate who will play on
our superstitions and emotions. You'll educate yourself on the issues
by using your own thought-processing appliances, the new com-
puters. So you'll be continually teaching yourself, continuously
learning.

Right now there is a great deal of concern about the drug prob-
lem in 20 years there will be hundreds of neurotransmitters that will
allow you to boost up and activate your brain and change mental
performance. There are going to be what I call brain radios — hear-
ing aids you put in your ear — that will pick up and communicate
with the electricity in your brain. You will be able to tune in any
brain aspect, like sex, that you want. You will speed up or slow
down your thinking. Anything you can do with chemicals you can
do with brain waves, and they are so much healthier. Drugs will
be old-fashioned. No one will be addicted because you can just turn
on the ultimate orgasm and keep it going for an hour. But how long
are you going to do that? You'll get bored. You're going to want
to turn it down or all. The criminality of drugs is what is causing
the so-called drug crisis, but if you legalize a brain radio — and
you're going to have to — everyone will have the ability to dial
into any emotional, mental, or sensual experience. We will use these
radios to think more clearly and above all, to communicate clearly
and above all, to communicate more clearly. The key to the twenty-
first century will be five words. TFYQA — think for yourself, and
question authority.

— T.P.S. RAJAN

CHEMARENA

S.L. VENKITESWARAN

High growth for Hydrogen Peroxide

Among the few chemicals which show a high growth now is hydrogen peroxide. Capacity increases and new plants have been spurred by surging demands for pulp and paper industry, waste water treatment and some new areas. North American capacity is estimated at 220,000 to 250,000 tonnes with actual production of 200,000 tonne in 1989. An expected 150,000 tonnes of new capacity is expected by 1993 to feed additional demand of same amount in the next five years. Two thirds of the new demand is for new uses - waste water treatment, chemical synthesis and food.

Interox is starting up a 20,000 TPA plant (at 100%) in Washington USA at a cost of $ 60 million. FMC is also completing a 30,000 TPA plant in British Columbia, Canada. Oxychem, a joint venture of Atochem & Air Liquide, is taking up a 40,000 TPA plant while DuPont is also going ahead with a similar venture, both in Canada. The new Chemo Thermo Mechanical Pulp — CTMP — process is used by new pulp units and uses hydrogen peroxide for bleaching. Pulp and paper industry may absorb 50% of peroxide production in the next few years due to increasing restraints on pollution. Other new markets are due to developments in aseptic food packaging, geothermal energy, and waste water treatment. Hydrogen peroxide is an ideal oxidant as it leaves no residues whatever. It can destroy and detoxify phenols, sulfides and mercaptans and a host of other unwanted organics.

An emerging use is in bioreclamation-which uses bacteria to biodegrade organics but with hydrogen peroxide as the source of oxygen. Bioaugmentation is another innovation and uses hydrogen peroxide along with ozone and ultra violet light to destroy toxic contaminants including perchloroethylene. The environment related market may be the major outlet by AD 2000. Ultrapure grades of hydrogen peroxide are used by electronic industry and in semiconductor production. More interesting is a possible use for cellulose conversion — into a non-caloric fibre source for human food or as a carbohydrate source for animals. Newer synthetic methods use it as an oxidiser. The switch to peroxide for chemical oxidation may be more costly but has advantages of generating no pollution. Present breakup in usage in USA is said to be --

Pulp paper	155 to 180 mill lbs
Environmental	74 to 90 mill lbs
Chemical synthesis	80 to 90 mill lbs
Textiles	60 mill lbs
Miscellaneous	50 mill lbs

India is yet to have a significant production at reasonable costs. Of the two plants, the new one is export oriented. There has been talk of a joint venture with DuPont for 5000 TPA (as 100%) but this is yet to take final shape. Technology is still the alkylanthraquinone oxidation route and there is no alternative to import. Hydrogen source and cost is a significant factor but otherwise it is a chemical of low direct cost of manufacture.

Can Vinylon fibre find a place?

The fibre from polyvinyl alcohol has been a unique development from Japan but has remained static and confined to Japan for nearly two decades until China started production with Japanese association. Kuraray is the producer of "Poval" through a unique process of reacting polyvinyl alcohol of the special grade with formaldehyde and then spinning the resultant resin. The fibre has properties closely resembling cotton with its comfort feel and has wide ranging dyeability and higher strength than cotton. Probably less than 25000 tonnes is the present market. Enquiries on possible introduction into India have shown little promise due to very high price of vinyl acetate monomer in India and at too small capacity levels to enable reasonably sized fibre plant at high investments.

Now there is news of a higher strength vinylon fibre from Kuraray who are building a 4000 TPA plant. The tensile strength of the fibre is said to be 13 g/denier, nearly 2.5 times that of the regular grade. This new grade is meant for industrial uses—as a substitute for asbestos in reinforcing concrete developed by a Swiss company. The potential market is said to be 20000 tonnes for Europe in 3 years. There is also a grade of vinylon used as thermal bonding fibre for use in adhesive tape and industrial-use paper. Flame retardant grade has also been developed by blending Poval with special inorganic fillers and blending with polynosic rayon. There is indeed possible new avenues of usage of this rather neglected fibre, away from textiles.

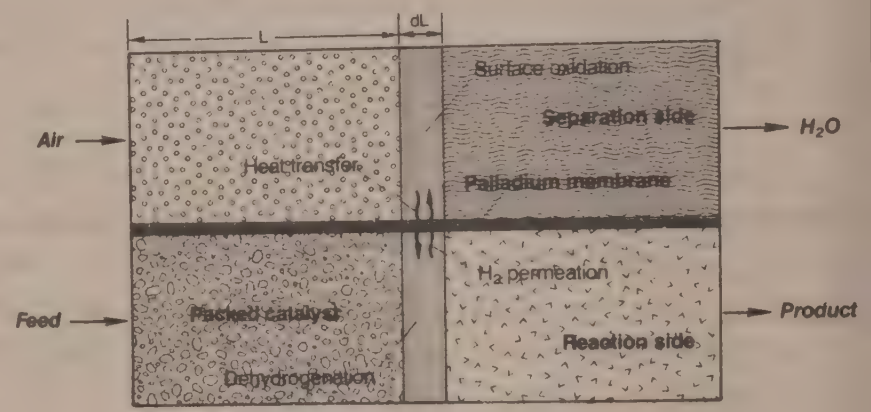
Membranes for methanol oxidation and dehydrogenation

The oxidation of methanol is conventionally by silver as catalyst either in a fibre network or in a heterogenous carrier. Now in a unique approach by a researcher at a University in Holland, the silver is implanted in an alumina membrane reactor which becomes a reactor-separator. This membrane has been under development for some years and the membrane can itself be a catalyst (perhaps for ethylene from ethanol) or coated with catalyst material. The reactor can be compartmentalised for convective flows of reactants and coupling of chemical and physical processes on either side. Alumina or silver loaded alumina with microporous top layers supported on substrates of alpha alumina. The silver on the surface reacts with methanol from the gas phase and formaldehyde is formed when catalyst is strongly bonded to the surface. Selectivity and optimisation of conditions have to be established — probably at 500-600°C. Regeneration cycles of catalyst surface can also be arranged.

The process is still at developmental stage and it is too early to foresee commercial use but it shows the scope for the new inorganic membranes.

At another centre in the University of Cincinatti, USA more valuable work is going on under an Indian expatriate professor Rakesh Govind and associates. They have a palladium membrane which is permeable only to hydrogen. When there is dehydrogenation on one side of the membrane the hydrogen going to the other side is oxidised by air and the dehydrogenation proceeds well with product coming out from the other end of reactor side. The oxidation of hydrogen generates heat which is suitably transferred to the reaction side. A notional model for this type of reaction is shown in the illustration. The studies with 1-butane showed good conversions to butene under adiabatic conditions in short reactor lengths. Other dehydrogenations like ethyl benzene to styrene and butene to butadienes as well as oxidation of methanol to formaldehyde are to be studied. Palladium alloyed with silver or transition metals is said to counter the effects of poisoning or embrittlement with hydrogen.

Membrane reactor model combines oxidation, dehydrogenation



Obviously the ceramic and metallic membranes could create a new generation of reactor/separators which can have higher thermodynamic enhancement of product or reactant limited reactions.

Stabilising geotextiles

Geotextiles is a new term in the use of plastics — as substitutes for materials such as sand and gravel or for run off control and environment protection. These are fibres from plastics meant for heavy duty usage including liners for containment ponds. The most widely used plastic is polypropylene. But the product requires to be protected against degradation in the open environment, from photo chemical reactions and also from excessive heat and shear. Better stabilisers have been introduced by Ciba-Geigy for geotextiles. The degradation mechanism is through chain scission or crosslinking.

For countering thermal degradation a radical terminating antioxidant — usually a complex hindered phenol — is used, along with phosphites and thioethers. Ultra violet stabilisers screen the polymer by absorbing ultra violet radiation or "quenching" molecules activated by UV radiation are used — typically nickel based organic complexes. Hindered amine light stabilisers HALS are another group. HALS is said to have produced a 10 fold rise in stabilisation. Combining primary antioxidant phosphites and HALS have the best effect. More complicated molecules are now the main products and the use of special antioxidants/stabilisers are in for high growth.

The estimated use of geotextiles is about 225 mill sq. metres in USA—quite a large market for polyolefines. For highways the geotextile is tacked down to the existing pavements with an asphalt emulsion and then new asphalt is laid on it—serves as a waterproofing barrier.

Such a barrier over the soil for foundations is said to be useful. Lining of drainage channels or ponds serves to prevent seepages. They serve also as a reinforcing media for retaining walls and other construction areas. The scope for such applications is indeed vast and cost effective.

Kunstoff project to go on stream by June

The Rs. 10 crore plastic pipes and tanks project of Kunstoff Industries Ltd., belonging to the Bharat Pipes group from Bombay, will go on stream by June 1990.

The unit will manufacture large diameter pipes ranging from 300 mm to 3000 mm and tanks for water and chemical storage scrubbers, gobar gas tanks, rain water collection, mini-sewerage plants etc, with state-of-the-art technology, under West German technology.

Addressing newsmen at Hyderabad during the AP dealers' conference on December 24, Mr. Pravin V. Sheth, the Promoter-Director of the Group stated the new products would be made, using spirally wound technology in contrast to the rotational moulding, which was outdated but was currently employed by all other manufacturers in the country. The new process lent more strength to the products and also saved lot of material, Mr. Sheth said. These pipes and tanks had export potential too.

Referring to group activities, Mr. Sheth stated, during the year 1989-90, turnover was expected to cross Rs. 100 crores with an all India network of over 400 dealers. The two sick units taken over by the group, Kaisan Plasto Private Ltd. at Tarapur, Maharashtra and Jaljyothi Plastics Private Ltd., Ahmedabad were modernised and doing well.

Bharat Pipes and Fittings Ltd. has now emerged as the number two company in PVC pipes manufacture in the country. With steady order book position and with a professional board of directors that includes Mr. V. Rajadhyaksha, Mr. Vasant Sheth, Mr. R. Banerji and Mr. C.J. Dadachandji the company will continue to serve with products of high quality, Mr. Sheth said.

REPLACE EXCISE DUTY WITH TAX PLEAD SSIs

A powerful plea has been made to the Union government for replacing the levy of excise duty on the small scale industries sector with levy of a slab-system based tax.

In a pre-budget memorandum to Mr. Madhu Dandavate, the Union Finance Minister, the Bombay Small Scale Industries Association has urged that, alternatively, the government should raise the excise duty exemption limit to Rs. 75 lakhs uniformly on all the small scale units, irrespective of whether they are registered with the state directorate of industries, what they produced or what was the end-use of the product.

Releasing the copy of the memorandum to the press, Mr. Mahendra Singh Bhatia and Mr. Raksh Pal Abrol, the association's president and secretary respectively, also urged the government to exclude the cost of raw materials for the purpose of computing the excise duty exemption limit in respect of job work units.

They pleaded that the licensing control should start at 98 per cent of the exemption limit of only the ongoing financial year, not the previous year. And the system of filing declaration by the small-scale industries units should be done away with. Besides, the criterion for classification of a product should be the nomenclature of the product and not the end-use of the product, they pleaded.

The association also pleaded that (a) the modvat credit should be equal to the excise duty paid, and nothing more, (b) duty assessment should be made automatic on the basis of invoice value and not of price list, (c) notifications 223, 224 and 225/87 pertaining to duty exemption to branded products made by the small units should be scrapped and (d) the power delegated to the government in 1986 to issue notifications should be withdrawn. The power is being misused, the association felt.

MRL SUBMITS REPORT ON NEW PROPOSALS

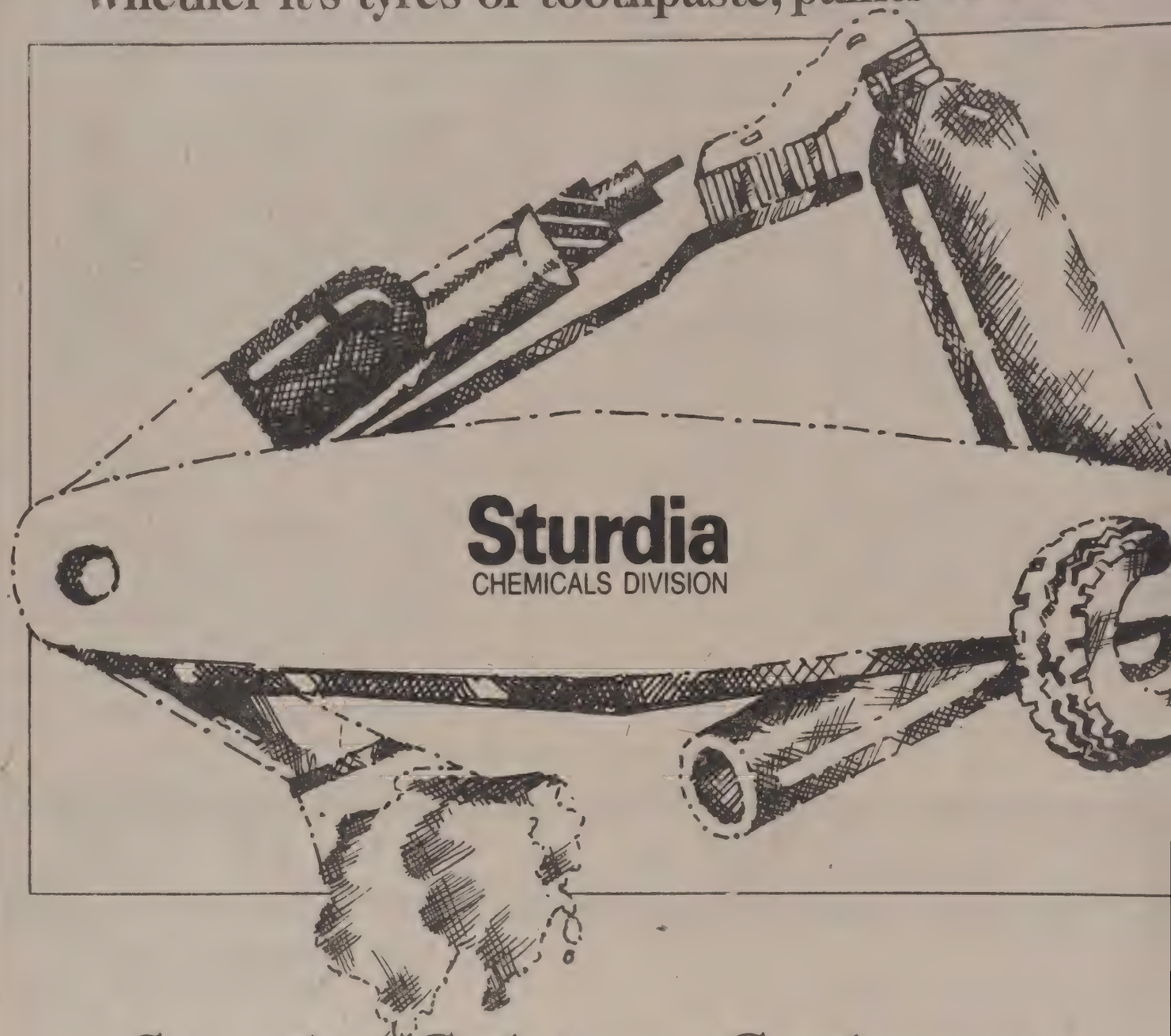
The Madras Refineries Ltd (MRL) has submitted a detailed feasibility report for setting up facilities for the distillation of 500,000 tonnes per annum of crude oil and separation of 16,500 tonnes per annum of LPG from the associated gas in the Cauvery Basin.

The Petroleum Minister Mr. M.S. Gurupadaswamy said that the project was estimated to cost Rs. 104.4 crores. At present there is no proposal to set up a bottling plant near the Cauvery Basin. The LPG available from the separation unit will be bottled in the existing plants at Tuticorin, he added. Mr. Gurupadaswamy said the Oil and Natural Gas Commission (ONGC) planned to take up some areas in Shagarh, Miajalar and Jaisalmer areas of Rajasthan for exploration in the Eighth Plan period. In addition to intensifying exploratory drilling in the already explored area of the Jaisalmer basin, OIL also proposed to take up exploratory drilling in the Bikaner-Nagaur basin in Rajasthan during the Eighth Plan.

DOUBTS ABOUT AOS DISPELLED

The Chairman of Gujarat-Godrej Innovative Chemicals Ltd. (Ginnova), Dr. B.P Godrej, has said in a rejoinder that the theory that the Alpha Olefin Sulphonate (AOS) suffers from tolerance of its lather to soil in wash water as untenable. He made this clarification in reply to a statement made by Mr. S.M. Datta, Vice-Chairman, Hindustan Lever Ltd. in his address at the National Conference on surfactants, emulsions and biocollids at IIT, Bombay recently. According to Mr. Godrej a four per cent addition of AOS in 37 per cent TFM soap gives a performance of 45 per cent TFM soap, resulting in sizeable economy. AOS is also recognised in Japan as a suitable high-suds detergent.

Whether it's tyres or toothpaste, paints or PVC...



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Associations role lauded

Inaugurating the Annual General Meeting of the Indian Chemical Merchants and Manufacturers Association on Saturday, the 16th December 1989, Shri T.C. Dutt, Chief Secretary to the Government of West Bengal, observed that the present industrial scene in West Bengal, in light of Haldia Petrochemicals Limited, indicated a definite shift towards progress. This was a right time to review the situation and take appropriate steps with a view to retrieving the past position.

Shri Dutt was of the opinion that West Bengal was in the brink of a great revolution when actually the Haldia Petrochemicals would be on stream. He felt that lack of modernisation and various other drawbacks actually made the small scale chemical industry sick. This industry should avail the opportunity of infrastructural facilities provided by the Government for the downstream at Haldia. He appreciated the role of the Association for last 45 years for the development of the chemical trade and industry in West Bengal.

Shri R.P. Goenka in his address as the Chief Guest observed that the Petrochemical Industry now-a-days occupied a very important role and was poised for a forward thrust. Haldia Petrochemicals Limited, foundation of which was laid on 15th October 1989 would play a vital role in the development of West Bengal. Shri Goenka assured that within two to four weeks the West Bengal Government would start the progress of Haldia Petrochemicals. He stressed on the serious need of second generation down stream units at Haldia which might be thought of by the small scale chemical industries.

He made an observation comparing the progress of the Western Region with that of the Eastern Region in regard to the chemical industries. He criticised the small scale chemical industry in West Bengal for not adopting the latest technology as well as research and development measures. In this connection, he observed that the entrepreneurs in West Bengal did not improve their position after 1920 for which they had landed in such deteriorating position. Shri Goenka observed that small and medium scale chemical industries would be given a package of incentives to be provided by the Government of West Bengal in the light of Haldia Petrochemicals Limited. He observed that biggest investment he had made in his life was indeed Haldia Petrochemicals.

Shri A.G. Bhanshali, in his Presidential address, emphasised the need for mutual co-operation and trust between the Government and the industrial and trading community for rapid growth of the small scale units just as those in Gujarat, Maharashtra and Tamil Nadu. The cumulative effect of uncontrolled inflationary trend, spiralling price of essential commodities, decreasing employment generation and comparatively low growth rate of production had brought the country on the verge of a critical situation.

He felt that small scale units could generate wealth and employment possibilities at a lesser capital investment. Shri Bhanshali felt that Haldia Petrochemicals Ltd., in the joint sector would change the industrial scene of West Bengal. Citing the various problems of the small scale chemical industry in this region, Shri Bhanshali observed that country's taxation system did not provide much incentive for savings in the corporate sector which deserved to be modified to enable the industry as a whole to generate more savings.

There was urgent and imperative need to rationalise sales tax structure so that the industry and trade in West

Bengal were not placed at a disadvantageous position vis-a-vis their counterparts in other states. The freight equalisation policy directly helped other states to develop industrially but the traditional industry in West Bengal was languishing with technological obsolescence. Significantly, the facility of freight equalisation was not available to other important raw materials including basic chemical raw materials.

Shri Bhanshali criticised the revision of tax payable to the Calcutta Municipal Corporation on profession, trade and callings at higher rates which had brought avoidable hardship to the small scale industry and trade. He also requested the Government to arrange for industrial estates inclusive of small scale industries somewhere in the suburb of the city with infrastructural facilities in line with Western Region of the country.

In conclusion Shri Bhanshali observed that various taxations, transport bottlenecks, lack of proper infrastructural facilities as well as lack of local entrepreneurship had brought the small scale chemical industry in this region in a problematic state.

Shri R.P. Goenka and Shri T.C. Dutt answered a series of questions from the audience pertaining to Haldia Petrochemicals. Shri A.R. Poddar, Vice-President, proposed a vote of thanks.

REFRESHER COURSE IN UV-VISIBLE AND IR SPECTROMETRY

The Department of Chemical Technology, University of Bombay is organising a four day refresher course in UV-Visible and IR Spectrometry, between Feb'·iary 28 and March 3, 1990.

Fees for the course is Rs. 1,000 per participant. Interested persons in quality control and R & D laboratories of the chemical industry can contact with biodata: Prof. T.S. Varadarajan, Department of Chemical Technology, Matunga Road, Matunga, Bombay 400 019, before January 25, 1990 for their details.

RAMESH BROS. GET-TOGETHER

A small get-together arranged by M/s. Ramesh Bros. to felicitate Mr. S.G. Hakim, Executive Vice President of Indian Organic Chemicals was held at Hotel Rivera, Ahmedabad on 20th Nov. 89. Prominent personalities from the dyes, chemicals, rubber chemicals industries gathered on the occasion.

Indian Organic Chemicals are the leading manufacturers of various alcohol based chemicals and polyester staple fibres with plants at Khopoli and Manali. M/s. Ramesh Bros., under the dynamic leadership of Mr. Ramesh F. Shah is the leading marketing organisation in Ahmedabad with branches at the important places in India. They are one of the important dealers of IOC products. The company has done a commendable job in marketing and popularising IOC products.

Speaking on the occasion Mr. Hakim gave out details of the IOC's present activities and its future policies and the products that are on the pipeline. Earlier Mr. Ramesh Shah welcomed Mr. Hakim and others. He expressed his happiness over his firm's association with IOC and commended the progress achieved by IOC. Mr. Deepak Shah partner of Ramesh Bros., proposed a hearty vote of thanks. The meeting was followed by a sumptuous dinner. As a token of appreciation, each participant was presented with a beautiful leather pouch.

SHRI AMBUJA PETROCHEM

Shri Ambuja Petrochemicals is in the red during the six-month period ended September 1989 with a gross loss of Rs. 76.23 lakhs against a gross profit of Rs. 133.49 lakhs in the same period last year. Its net sales are, however, better at Rs. 9.24 crores against Rs. 9.05 crores. After depreciation (Rs. 60 lakhs against Rs. 46.83 lakhs), there is a net deficit of Rs. 136.23 lakhs during the period in contrast to the corresponding period's net profit of Rs. 86.66 lakhs.

Mr. S.G. Hakim, Executive Vice President of IOC addressing the gathering. On his left is Mr. Ramesh Shah of Ramesh Bros.

Cetex Petro plans MEK plant

Cetex Petrochemicals Ltd., promoted by CTI Investment Limited, a subsidiary of Ceat Tyres Limited belonging to the RPG group, is coming out with a public issue of Rs. 288 lakhs (equity of Rs. 10 each for cash at par) and Rs. 84.5 lakhs for Ceat shareholders on January 31, 1990 to part finance the proposed methyl ethyl ketone (MEK) project near Madras.

According to Dr. K.K. Maheshwari, president of the Cetex, the funds would be for part financing the Rs. 18.9 crore MEK project, slated to commence production in March 1990. The plant's capacity is 4000 TPA. The company has signed a collaboration agreement with the Edeleanu of West Germany, a leading company in the manufacture of MEK and other petroleum products.

MEK is an extensively used import substitute and a versatile petrochemical solvent in various industries, mainly in lube oil, magnetic tape, printing ink, rubber, varnish, pharmaceuticals etc.

The basic raw material for MEK is butene-rich LPG, which the Madras Refineries Limited (MRL) has agreed to supply regularly and for which a pipeline has also been laid. The MRL is setting up a ''delicated facility'' for this purpose, according to Mr. R. Kothandaraman, general manager, Cetex, which is expected to be commissioned in February 1990.

This fully automated plant, with the latest electronic control devices, is expected to function at 70 per cent capacity in the first year and reach 90 per cent, in the third year of operation. At optimum capacity utilisation, the turnover is expected to be around Rs. 20 crores, profit after tax is estimated at Rs. 300 lakhs. The cash break-even of the project is around 30 per cent and the net break even is at 52 per cent.

The company sources said that the company had already commenced market seeding and the response was encouraging. The collaborators have agreed to lift 1000 TPA for exports (which will be equivalent to 25 per cent of the installed capacity) at internationally competitive prices.

With the anticipated market for MEK in 1990 above 5000 MT, Cetex is assured of a good market. A growth of 12-15 per cent per annum is expected as major expansions are on the anvil in the lube oil, dewaxing, magnetic tape and polyurethane adhesives industry.

MEK has not yet been indigenously produced. Its usage so far has been confined to those industries where alternate solvents could not be used. The import of MEK during 1989 was estimated a 4000 MT. Of the total project cost o Rs. 18.9 crores, promoters will be contributing Rs. 472.50 lakhs, public Rs. 288 lakh, Ceat shareholders Rs. 84.50 lakhs, term loans from ICICI IDBI and IFC Rs. 495 lakhs, SB Rs. 180 lakhs and NCD's Rs. 370 lakhs. NCD's shall be privately placed with the SBI Mutual Fund.

OIL OUTPUT TO BE STEPPED UP

The government proposes to step up oil production during the Eighth Plan period, Petroleum Minister Mr. M.S. Gurupadaswamy said. The tentative target for crude oil production in the terminal year of the Eighth Plan (1994-95) is about 50 million tonnes, he said.

In reply to another question, the minister said gas production is expected to be about 40 million cubic metres per day in the terminal year of the Eighth Plan against 22 million cubic metres per day at present.

ONGC has discovered gas deposits in three areas in the Bombay offshore, Kutch offshore and Cauvery offshore basins in 1989-90, he said. In the B-119 structure of Bombay offshore, about 1.5 billion cubic metres of gas had been established while assessment of the other structures is under way.

International biogas meet at Pune

The international biogas conference ointly organised by the Indian and German governments in Pune (January 0-15) is being looked forward to as a urning point in application technologies s well as in new perspectives that will e afforded in the utilisation of this nergy sector for industrial and devel-ping countries alike.

The ministry, which is directly con-cerned with both the organisation and he implications of this indepth inter-changes of biogas technology and experience, has stepped up its priority for assisting exploitation of non-conventional sources of energy in developing countries of which biomas forms an important constituent.The Pune conference, which will be chaired by Dr. Maheswar Dayal, secretary, department of non-conventional energy sources, Government of India, is expected to highlight, among other things, the role of non-governmental organisations in intensifying the propo-gation of the lessons of the biogas experience so far, with particular emphasis on what India had to offer to terms enlarging the technology in rela-tion to serving the needs of rural areas more effectively. The German city-state of Bremen is also associating itself with the deliberations of the conference as also organisationally by virtue of its ongoing project plans in India through the Bremen Overseas Research Devel-opment Association (BORDA).

Bonn's parliamentary state secretary at the aid ministry (BMZ) Hanspeter Repnik made it clear, that a positive direction for the future for solutions to energy problems that were both eco-nomically and ecologically sound, would emerge from the Pune confer-ence, also helping to provide more clar-ity to development policies of the Federal Republic. "I expect new impul-ses for a broadening of this energy source which has an important contri-bution to make towards easening of energy problems in rural households of developing countries", Mr. Repnik stated, adding that while the technology was not simple, considerable expertise had been gained hitherto in its under-standing and potential, thus paving the way for more concerted action the area. The use and promotion of biogas needed to be advanced by both governments and non-governmental organisations in the common interest of protecting the environment and using resources spar-ingly, it was pointed out.The Pune con-ference will also go into the socio-economic as well as the financing aspects of biogas plants, looking at the main target group of farmers, women entrepreneurs and others, and drawing unreliable evaluation and monitoring producers. High-medium-low-tech solu-tions to varying problems and benefits to the national economy and ecology are some of the other areas of interest to emerge from the meet.

CHEMEXCIL to tap new markets

Against the backdrop of substantial growth in exports during the current year totalling around Rs. 2500 crores (target: Rs. 2100 crores) and pitted against an ambitious target of Rs. 10,000 crores by 1994-95, the Basic Chemicals, Pharmaceuticals and Cosmetics Export Promotion Council (CHEMEXCIL) is laying major emphasis on the Eastern Europe and South-East Asian markets in coming years. With this end in view, the council is sending delegations to China, Australia and New Zealand.

Disclosing this at a meeting of the eastern regional members of the council, Mr. Ramu Deora, Chairman, said that all these years Indian products were being exported to China through third countries. The visit of a high-level delegation from China a few months ago have opened up the gate for direct co-operation and it was expected that Indian exporters now would be able to deal directly with the Chinese clients, he added.

It is significant to note that the CHEMEXCIL members have already registered substantial growth in exports during the current fiscal year. During the first seven months exports stood at Rs. 915 crores. Being encouraged with the present upswing, the CHEMEXCIL has set an ambitious target of Rs. 10,000 crores for the Eighth Plan and Rs. 20,000 crores by the turn of the century. Compared with Rs. 2,500 crores during this year, last year's exports stood at Rs. 1,247 crores against Rs. 562 crores in 1987-88. The chairman mentioned that the US has emerged as one of the potential buyers of bulk drugs, which has contributed to a great extent for the increase in export of this group. Many of the Indian exporters specially from SSI sector have got registration with the US Food and Drug Administration which will definitely give a boost to the exports of bulk drugs to the US. Exports of dyes and dye intermediates have increased from Rs. 214 crores in 1987-88 to Rs. 401 crores in 1988-89, registering an increase of 87%. The CHEMEXCIL chairman emphasised that the total markets for dyestuffs in Japan is estimated to be around Rs. 358.5 crores and the industry is confident to get atleast 10 per cent of this market share within a couple of years.

The council has fixed a target of Rs. 665 crores for the current year which in all probability may be surpassed before the close of the financial year, if the raw materials availability ease further. Mr. Deora pointed out the USSR has emerged as one of the largest market for the council's items. A high-power delegation from Medexport, a buying organisation of the USSR, visited India during July 1989 and placed orders with Indian exporters to the extent of Rs. 275 crores and the delivery is expected to be completed before the close of the financial year.

PRICE REVISION LEAVES ASPIRIN PRODUCERS DISAPPOINTED

Indigenous producers of bulk drug Aspirin are disappointed at the recent revision in the price of their product under Drugs (Price Control) Order. "The hike in price granted is half hearted and does not adequately compensate for the substantial increase in cost and lower capacity utilisation", according to industry sources. The department of chemicals and petrochemicals under the Union ministry of industry, through a recent order has raised the maximum selling price of bulk drugs Aspirin to Rs. 90 per kg. from Rs.71. Aspirin is one of the widely used analgesic. It is largely used in various pain killer tablets such as Aspro, Anacin, Disprin, Stopache, Penjon etc. There are four manufacturers of Aspirin in the country with an installed capacity of 4,500 tonnes per annum.

Promising outlook for pharmaceutical units

The pharmaceutical industry is increasing significantly its output and sales with the implementation of modernisation and expansion schemes. The liberal pricing policy also has been helpful in improving profitability and it is expected that the performance of the established units in 1989-90 will be highly gratifying.

The working results of Glaxo, Hindustan Ciba, Hoechst, Ranbaxy Laboratories and others for the half year ended September 30,1989 give rise to optimism about the immediate outlook. Proctor and Gamble too has been enlarging its turnover and profits with a big increase in the offtake of health care products. The expectations of higher dividends and even issue of bonus shares by some companies have been responsible for the sharp rise in prices for popular scrips.

Sharp rise in equity values: Hectic actitivity has been witnessed in Hindustan Ciba with its quotation jumping to Rs. 1,435 from Rs. 880. While the working results for the six months ended September 30, 1989 have been encouraging, it is being speculated whether there will be any bonus issue by the company. Reserves stood at Rs. 40.07 crores, including capital reserve of Rs. 170.35 lakhs, at the end of 1988-89 against the equity capital of Rs. 17.71 crores. No bonus issue has been made by the directors since the equity shares were listed on the stock exchange.

Hoechst India, likewise, has been hotly favoured with its rate at a new peak of Rs. 2,010 against Rs. 880. The working results for 1989-90 should be highly impressive judging by the progress made so far. A dividend of 20 per cent, taxable, was paid for the 15 months ended March 31, 1989 absorbing of Rs. 1.91 crores out of the net profit, after taxation, of Rs. 4.06 crores. The amount was thus covered two times by disposable profits.

Glaxo has improved to Rs. 101 from Rs. 94.50. It had ample reserves of Rs. 46.07 crores on March 31, 1989 against the equity capital of Rs. 20 crores. A dividend of 20 per cent, taxable, was paid for the nine months ended March 31, 1989. It remains to be seen what decision the management will take in respect of bonus issue as the activities of associated companies also are proving to be helpful.

Ranbaxy Laboratories has been achieving spectacular growth in output and sales and its equities are popular at Rs. 103.75 against Rs. 92.50. The last bonus issue was, ofcourse, in 1988 in the ratio of two shares for every five equity shares. May and Baker has spurted to Rs. 76 from Rs. 60.63 and Pfizer to Rs. 95.50 from Rs. 66. It is therefore, being discussed in market circles what will be the decision of various managements in respect of the distribution of profits and capitalisation of reserves.

OIL INDIA STAKE IN PAPUA NEW GUINEA VENTURE UNDER STUDY

The Petroleum Ministry is considering a proposal of Oil India to acquire a stake in an existing oil exploration and production venture in Papua, New Guinea. Premier Consolidated of U.K. is holding a contract for exploration and production in the area. About 60 per cent of stake in the contract is being offeered by it for sale to other interested parties. Oil India has, however, proposed to acquire only 30 per cent stake in the venture. This would mean that Oil India would have to put in about $10 million in the venture. The government had earlier allowed ONGC Videsh to acquire a stake in an exploration and production sharing contract in Malaysia by buying the stake partly held by Agip (Overseas) of Italy.

WISHING YOU ALL A VERY HAPPY, HEALTHY PROSPEROUS NEW YEAR 1990

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Pollution control board should be upgraded: expert

The Task Force on Environment of the Eighth Five-Year Plan has suggested to the Tamil Nadu Government to strengthen and develop the Pollution Control Board by drafting the services of professionals and naturalists in checking environmental degradation, according to Dr. M.S. Swaminathan, president, International Union for Conservation of Nature and Natural Resources (IUCN).

Inaugurating a two-day exhibition on "City waterways" organised by the Worldwide Fund for Nature-India and Madras Naturalists Society at the CLRI Kendriya Vidyalaya, Adyar, he said the Board could be upgraded as a protection and promotional body with more powers, on the lines of Environmental Protection Agency (EPA) of the United States.

Dr. Swaminathan, who heads the Task Force, said people's involvement was imperative in such a stupendous task, and small groups should be set up in villages and towns which would be feeding the apex body with information on the various pollution problems. Setting up of a technical advisory group with eminent persons drawn from academia, ecology and civil engineering would help the Board to a great extent in solving the problems.

Dr. Swaminathan said the youth power should be channelised to check the deleterious effects of pollution by helping them to organise neighbourhood groups to learn about nature and contribute their mite for creating clean environs. Awareness through action programmes among youth and children brought them to the vanguard of the movement to prevent any abuse of the and. "Children should be the watchdogs of society for clean environment".

Dr. Swaminathan said environment was not the business of the government alone. Micro organisms had been poisoned, toxic and plastic wastes had increased and pollution grown. He said environmental courts suggested by Mr. Justice Bhagwati, should be established in cities and towns to check the offenders. He appealed to the students to participate in the eradication of mosquito programmes in the city.

Mr. M.V.J. Rajan, president, Madras Naturalists Society, welcoming the gathering, said that a campaign had been launched for a cleaner and healthier Madras which was possible only if the terrible cesspools of waterways were cleaned up and made fit for the habitation of aquatic life.

Mr. Preston Ahimaz, State Organise of the Worldwide Fund for Nature India, said the WWF-1 had launched massive campaign to clean the thre waterways of the city — the Cooum, th Adyar and the Buckingham Canal. A a first step, school children were bein involved in the creation of awarenes and motivation programmes with th help of nature clubs.

GAS-BASED MAGNESIUM PROJECT FOR TRIPURA

A Rs. 60-crore magnesium meta project with an annual capacity of 4,000 tonnes, based on Japanese technology will be set up near Agartala by the Calcutta based Ispat Alloys Limited. The project will not only be the first major private sector venture in Tripura which has abundant natural gas resources, but will also be the first to produce magnesium metal in the country.

According to Mr. M.R. Rao, Executive Director of the company, the import substitution project would be commissioned by the middle of 1991. The company has signed a memorandum of understanding with Mitsui and Company of Japan. The technology and critical equipment for the project will be supplied by Ube Industries Limited of Japan.

Stress on chemical engineers' role

A bigger role for chemical engineers ne planning process, environmental ection, industrial safety planning control, was urged by the 42nd ual session of the Indian Institute of emical Engineers (IIChe) which con-ded at Trivandrum in the third week December.

The 600-odd delegates to this onal convention felt that chemical ineers were not given their rightful ce in the planning process of the ntry and also in areas like industrial ety, pollution control etc. where they e a definite role to play.

The industrialist, Mr. Vijay Mallya, airman of the UB group, who inau-ated the session said the Government uld draw on the expertise of the pro-sionals when charting out policies. and large, policy makers were not alified to make decisions.

Mr. Mallya emphasised the need for recognition to the Chemical gineers' Institute as a consultative dy. It should be invited to participate olicy discussions on chemical indus-s. He urged the Government to issue per guidelineSs in the form of a hite paper" on the industry. This s necessary to give it proper direc-n for its growth.

The growth of the chemical sector uld help boost other ancillary indus-s. Through a white paper the direc-ns and role of the government risaged could be made known. The going President, Dr. P.V.S. Nam-odiripad stressed the need for better rdination and interaction between demic institutions and the industrial ts so that the country could get the ht type of the chemical engineers.

RTPC NOD FOR NYLON 66 OJECT

The controversial nylon-66 project proposed to be set up by Du Pont of the US and the Thapars has been cleared by the Monopolies and Restrictive Trade Practices Commission. The clearing has not yet been officially announced but sources handling the joint venture have been told by Ministry sources that it is through.

The proposal is now before the Projects Approval Board which would meet shortly. This is another confirmation that the project has received the MRTPC clearance because PAB normally comes into the picture only after the MRTPC gives the green signal for the project application.

The Thapar-Du Pont joint venture to make nylon-66 was floated about two years ago but has met with stiff opposition ever since. The original proposal was shot down by the MRTP Commission earlier last year.

The project is seen by many as an opening gambit by Du Pont for entering India. That is why both the partners have stuck to the difficult job of convincing the Government and various industry lobbies that the project is sound and does not jeopardise the interests of existing producers of nylon 66. The project was originally supposed to cost Rs. 180 crores but current revised cost is around Rs. 250 crores.

INDUSTRIAL OUTPUT INDEX UP

According to quick estimates the general index of industrial production, base 1980-81, for September stood at 182.5, which is higher by 6.1 per cent as compared to the corresponding month last year.

The average index for six months ending September stands at 179.4 which is higher by 4.1 per cent as compared to 172.3 for the corresponding period previous year.

Drug research and rural health

Addressing the Indian Pharmaceutical Congress in Bombay, the Union Minister of State for Science and Technology, Prof. M.G.K. Menon, took the drug industry to task for neglecting the development of tropical medicines through research & development. In a tropical country like India the industry is expected to gear its R and D to tackle tropical diseases such as amoebiasis, intestinal worm infections, leprosy, tuberculosis and filariasis. Unfortunately, the industry's research programme is designed to tackle cardio-vascular diseases, cancer, infections and neurological problems.

The Government must share the blame for this unhappy state of affairs. The drug pricing policy adopted by the Government has, over the years, undermined the financial strength of the industry, so much so that the industry has lamented that "Government financial" institutions, which provide a substantial share of funds required for industrial development and growth, are increasingly becoming reluctant to fund expansion of the drug industry because of its low profitability.

Moreover, the cost of discovering a new drug has soared to Rs. 50-70 crores. The Government is anxious to control the prices, among others of tropical medicines as the purchasing power of their users is relatively low. In the circumstances, it is not surprising that the industry has only a modest R and D programme, and that too is geared to cure diseases of those people who can afford to foot the bill. It is possible that the industry will adopt a more positive approach to research on tropical diseases once it is enabled to strengthen its financial basis. Till then, however, the Government and the industry will have to intensify their efforts to improve the availability of drugs in rural areas. The Secretary to the Union Ministry of Health, Mr. R. Srinivasan, naturally underlined the need to strengthen the network of primary health centres.

The Union and State Governments ought to address this issue with the help of the industry. The Government has neglected studies on the pattern of diseases in relation to groups of people in given rural areas. The absence of these epidemiological data handicaps the industry. This ought to be looked into for improving the health of rural people. No less urgent is the need to supply clean drinking water to them. This will dramatically reduce the high incidence of water-borne diseases in rural areas.

The Government can also help both rural and urban people by reducing the burden of taxes and duties on drugs. Prof. Menon exhorted the industry to supply drugs at affordable prices. This is however, easier said than done, considering that the industry is unable to secure reasonable margin of profit. In fact, the industry's profit before tax as a proportion of sales declined to about five per cent in 1987-88 against 11.7 per cent a decade earlier. This only shows that the Government will have to give tax relief to the industry if drug prices are to be lowered.

CCL PROFITS

Central Coalfields Ltd. expects to close the current financial year with a profit of Rs. 5 crores.

This is the first time since reorganisation of the subsidiaries of Coal India Ltd. that CCL will be earning profit. Before reorganisation, as a result of which it had to part with the Singrauli and Talcher fields, it was among the top ten profit earning public sector companies.

A series of measures to rationalise manpower, optimise utilisation of resources and control costs are enabling the company to return to the last of profit earning subsidiaries of CIL.

BHOPAL ACT VALID

SC confirms $470 m. settlement

A Constitution Bench of the Supreme Court upheld the validity of the Bhopal Gas Leak Disaster (Processing of Claims) Act, 1985, and thus confirmed the $470 million settlement of all claims against the multinational Union Carbide.

The five-judge Bench, in three separate but concurring judgements, directed the Government of India to continue to pay interim compensation to the victims. The Chief Justice, Mr. Sabyasachi Mukherji, in his judgement, which he delivered along with Mr. Justice K.N. Saikia, observed that "no useful purpose would have been served by giving a post-decisional hearing in the case".

Mr. Justice K.N. Singh, in his separate judgement, agreed with the main findings of the other judges, and suggested to the Government the setting up of "a statutory funds of permanent nature" to give quick relief to victims of national disasters.

More than 3300 people were killed and about two lakh affected in the world's worst industrial disaster on December 3, 1984, when deadly MIC gas leaked in huge quantities from the Union Carbide's Bhopal plant.

Mr. Justice S. Ranganathan and Mr. Justice A.M. Ahmadi, who gave the third judgement, also concurred with other members of the Constitution Bench which was set up barely two weeks after the February 14 order of the Supreme Court, announcing the $470-million settlement.

The Chief Justice, Mr. Mukherji, observed in his judgement: the (impunged) Act was conceived on the noble promise of giving relief and succour to the dumb, pale, meek and impoverished victims of the disaster. "The Act is constitutionally valid".

"It proceeds on the hypothesis that the initial claim of the victims are realised or obtained from the delinquent multinationals — Union Carbide Corporation and Union Carbide of India Ltd. — by settlement or adjudication or any other proceeding".

On the question of notices required to be issued to the victims under Section 4 of the Act, the Chief Justice said, "in the facts and circumstances of the case, no useful purpose would have been served by giving a post-decisional hearing", Mr. Justice K.N. Singh in his judgement suggested to Parliament enactment of a legislation to set up a national disaster relief fund to give speedy compensation to the affected people.

The impunged Act gave the Government of India sole authority to represent all the gas victims. Soon after the settlement order, the compensation case got bogged down in a cobweb of legalities and a Bench was set up by the then Chief Justice to decide the validity of the Act, under which the settlement was arrived at.

The judgement was reserved by the Constitution Bench after hearing for several weeks the five petitions, filed as public interest litigation. The key petition, filed by the Advocate, Mr. Charan Lal Sahu, challenged the constitutionality and legality of the Act contending that the Government could not have "usurped" the right of the victims to go to court. Of the other petitions, two were from gas victims associations and two from lawyers known for advocating the social welfare cases. One petition urged the court to direct the Union of India to pay the difference between $3 billion, which the Government of India originally used for, and the settlement of $470 million.

New pricing norms may hit fertiliser units

Almost all fertiliser units in the country are likely to suffer severe losses this year due to changes in the pricing and depreciation norms recently introduced by the Union Department of Fertilisers. Industry sources pointed out that several units, including the public sector ones, are already facing a liquidity problem and nil-profits this financial year. This may seriously affect new investments in fertiliser units.

The newly-commissioned bigger units, particularly the ones on the HBJ gas pipelines, are said to be worse affected. According to indications any profit making by these units and subsequent redeployment of profit in newer units are ruled out. This predicament is the result of a government order lowering the plants depreciation rate from 10.75 per cent to a mere 4.75 per cent. The basis for fertiliser retention price and subsidy are calculated on this depreciation.

Earlier, this eligibility for depreciation was based on an assumed ten year life time for the plant and machinery. It has now been raised to 20 years by which time most fertiliser plants become aged and sick. The sources pointed out that the new fertiliser may find it difficult in this situation even to repay the loans they took from public financial institutions.

Though the previous Government had promised to review the latest pricing and depreciation norms, it had not done anything till the end of its tenure, the sources added.

The financial problems being faced by the fertiliser units may look paradoxical when one takes into account that both the 1988-89 fertiliser production of 8.9 million tonnes and consumption of 11 million tonnes were records.

Though the quantum leap of 2.3 million tonnes in fertiliser consumption during the year to take the total to 11 million tonnes was commendable, it is still short of the consumption target of 12.2 to 13 million tonnes fixed for the terminal year of the Seventh Plan (1989-90).

The actual consumption in 1989-90 is expected to be only 11.6 million tonnes, according to the estimates made by the Fertiliser Association of India.

The sources said there is an urgent need to create additional fertiliser production capacity, particularly in nitrogen fertilisers. So far no new capacity is envisaged for the Eighth Plan. If these issues are not tackled immediately, more fertiliser imports will have to be made further draining on the precarious foreign exchange reserves, the sour said.

GODBOLE TAKES OVER AS PETROLEUM SECRETARY

Dr. Madhav Godbole took over as new secretary for petroleum and natu gas and held meetings with the sen officials of the ministry on Decem 26.

Dr. Godbole, who is an IAS offi of the 1959 batch and belongs to Maharashtra cadre, was principal s retary, finance department, governm of Maharashtra before he took over present office.

Dr. Godbole who has worked in va ious responsible positions in the go ernment for over 30 years, has also he charges of senior industrial econom and senior development policy offic Asian Development Bank, Manila, Ph lippines, joint secretary, Department Economic Affairs, Ministry of Financ Government of India.

CSIR AWARDS

Dr. K.B. Sinha of the Indian Statis ical Institute, New Delhi and Dr. B.M Banerjee of Himachal Pradesh Unive sity, Shimla, have been awarded th Shanti Swarup Bhatnagar Prize Mathematical Sciences for 1988.

Work begins on JK's Saleempur plant

The Delhi-based JK Synthetics group has begun work in earnest on its Rs. 1,250-crore Saleempur petrochemical complex by tieing up with the American conglomerate, UOP, for its aromatic complex.

Negotiations are currently on with ICI of UK, Mitsui of Japan and Amoco of the US for technical and financial collaboration for the downstream purified terephthalic acid (PTA) plant. Informed sources claim that Amoco is likely to emerge as the final choice. The tie-up will be signed shortly.

Project work is slated to start this month. The complex is scheduled to go on stream by the last guaranter of 1992. A memorandum of understanding (MoU) will also be signed shortly with IOC for supply of 3.5 lakh tonnes of high grade naphtha from the Mathura refinery. IOC has agreed to set up a splitting plant for the naphtha in Mathura at a cost of around Rs. 35 crores. This would save JK the trouble of laying an additional pipeline between their complex and Mathura refinery.

The group has acquired 850 acres of land from the UP government — a site that is 55 km away from Mathura refinery. Water and power supplies have been tied up and the green signal from the state pollution board has come through. Necessary central clearance, for capital goods and the MRTP Commission, have also been obtained.

The pattern of financing envisages a conventional debt-equity ratio of three to one. International financial institutions and its financial and technical collaborator would take care of a major chunk of the debt element. The instrument for mobilisation of the equity has not yet been worked out, but is likely to be in the form of convertible debentures, with the call money and conversion to be timed with requirement of funds and generation of cash flows. A separate company, J.K. Petrochemicals Ltd., has been launched for the project. Plans to float the complex as part of JK Synthetics were dropped when the question of foreign equity participation came up. It was also felt that it would be unfair to burden the existing company with the onus of an additional and huge capital base.

The aromatic complex would manufacture three basic components — benzene, orthoxylene and paraxylene, the latter to be converted into PTA. According to company sources, around one lakh tonnes or 50 per cent of the capacity would be consumed in-house by JK Synthetics and its associated units. It would also have a locational advantage of being less than 150 km away from several major consumers of PTA. In any case, the break-even point is at around 65% of the capacity — the demand for which would not be difficult to find.

Scramble for Haldia project

The Haldia petro-chemical complex project, awaiting the Central Government's clearance for the last 12 years, has suddenly become the most sought-after project for several front-ranking industralists in the country. One industralist was candid enough to admit that the change in the government at the Centre had made him interested in investing in the West Bengal project.

Interest in the Haldia project was revived in October when the former Prime Minister, Mr. Rajiv Gandhi, on the eve of the announcement of the Lok Sabha elections suddenly decided to lay the foundation-stone for the project without finalisation of its design, size and financial aspects. Mr. Gandhi persuaded the state chief minister, Mr. Jyoti Basu, to accompany him to Haldia from Delhi for the foundation ceremony.

Nothing was heard about the project after this and Mr. Basu told election meetings that he was convinced it was yet another election gimmick by Mr. Gandhi.

After the minority National Front government came to power at the Centre with the support of the BJP and the Left Front, there was a general expectation in West Bengal that the state's outstanding industrial projects lying with the Centre, particularly the Haldia petro-chemical and the Bakreshwar thermal power projects, would now receive an early clearance.

Asked about the chances of Central clearance for the projects on his return to Calcutta from Delhi after the formation of the new Union council of ministers, Mr. Basu scoffed: They have more important things to do at this moment." But subsequent developments make one suspect that Mr. Basu was being diplomatic that day. The first inkling of the rapidly changing developments about the Haldia project came to light on December 12, when Mr. Tapan Sikdar, the general secretary of the West Bengal unit of the BJP, stated that the CPM was trying to associate the Ambanis of the Reliance group in the downstream projects of the Haldia complex because of their reportedly close links with the chief minister's son.

The following day, the state's finance minister, Mr. Asim Dasgupta, admitted that apart from the R. P. Goenka group, the original co-promoter of the joint sector Haldia Petro-chemical Limited, the state government had started negotiations with several other industrialists, including the Ambanis. He said this had become necessary as the cost of the project had gone up from the original Rs. 428 crores to Rs. 3,000 crores because of the delay in the clearance and also because of doubling the size of the naphtha cracker plant.

When the joint sector Haldia project was set up in 1985, its cost had already touched Rs. 1,470 crores. But the Centre refused to give it clearance on the plea that the naphtha plant with a capacity to produce 139,000 tons of ethylene would not be economically viable.

Thereafter, following negotiations and reviews, it was decided earlier this year that in order to make the project economically viable, the project would be upgraded with the naphtha cracker plant's capacity raised to 350,000 tons and the cost, consequently, going up to Rs. 3,000 crores.

Mr. Dasgupta said that as the government was keen on starting the project at the earliest, and since the share of the private co-promoter of the joint sector project had gone up with the rise in the cost, investment by other private co-promoters had become imperative to preserve the state's interest.

On December 14, Mr. Dhirubhai Ambani's son, Mukesh, met Mr. Dasgupta, to submit the Reliance group's proposal for investment in some of the downstream projects. Mr. R. P. Goenka and his son, Sanjiv, the original co-promoters, associated with the construction of the naphtha cracker plant and four of the eight downstream units, also met the finance minister. Later, Mr. Mukesh Ambani, Mr.R.P. Goenka and Sanjiv together met the chief minister for a joint discussion on the matter.

The same day, another Bombay-based industralist, Mr. Viren J.Shah, of the Mukand Steel group, who is also the president of Assocham, met the chief minister. The following day, Mr. Shah's two sons, Rajesh and Sukumar, held talks with Mr. Dasgupta with video-projections of their activities in the finance minister's chamber.

Asked whether he was being edged out of the Haldia project, the original co-promoter, Mr. R. P. Goenka, said as long as Mr. Basu was there, no one could edge him out.

On December 16, a local industralist, Mr. M. L. Mittal, on the Ispat group, held talks with the state's finance minister for investment in the project. Later, describing the talks as of a preliminary nature, Mr. Mittal told reporters, that his group was prepared to invest up to Rs. 2,000 crores for any suitable project. Mr. Viren J. Shah also told reprters the same day that his group was prepared to invest Rs. 1,000 crores for the downstream projects.

On December 17, after the chief minister met Mr.J.R.D. Tata, Mr. Viren Shah and some other local industralists, Mr. Tata told reporters that he was not interested in the Haldia project and that his interest was in environmental pollution. Mr. Mittal met the chief minister and the finance minister recently and showed video-projections of the firm's capabilities.

Mr. Dasgupta said, that Mr. Bharat

Hari Singhania, of the JK group, and Mr. B. M. Khaitan, of the MacNeil Magor, were likely to meet him in a couple of days for talks on their possible participation in the project. Mr. Raunaq Singh, president of FICCI, who is scheduled to come to Calcutta, might also throw his hat in the ring, it is learnt.

There is thus now a scramble for investment in the Haldia project, while before the election there were no takers for it except for the Goenkas. No doubt, the change in the political scenario at the Centre has made the Marxists acceptable to the industralists.

Mr. Basu, on his part, said that his government was not concerned whether the project was assisted by the Ambanis or by any other industralists "We are only interested in its early implementation." All aspects of the project are likely to figure in Mr. Basu's talks with the Prime Minister, Mr. V.P. Singh, in the first week of January before it is finalised.

KARNAL REFINERY PROJECT: MINISTRY ASKED TO ACCELERATE EXECUTION

The petroleum and chemicals minister, Mr. M. S. Gurupadaswamy, has asked his ministry to sort out any hitch over implementation of the Karnal refinery within a month and to ensure that the project is executed without delay. A press release issued by the Haryana government says the state chief minister, Mr. Om Prakash Chautala, met Mr. Gurupadaswamy at Delhi recently and complained that the Karnal refinery, the foundation stone of which was laid three years ago by the former Prime Minister, has shown no progress whatsoever. He urged the petroleum minister to start the work immediately.

Mr. Chautala also discussed with Mr. Gurupadaswamy the question of petroleum exploration by the Oil and Natural Gas Commission (ONGC) at Naraingarh, Sadhaura, Morni and Shahabad areas for which ONGC already has a licence. The Haryana chief minister requested the petroleum and chemicals minister to ask ONGC to start the work immediately. Mr. Gurupadawamy assured Mr. Chautala that he will soon call the ONGC officials and apprise him of the action.

The Haryana chief minister also called on the energy minister, Mr. Arif Mohd. Khan, and discussed with him the problem of Yamunanagar thermal power plant. Mr. Chautala said the project was handed over to the National Thermal Power Corporation (NTPC) two and a half years back but no progress has been made. The energy minister promised expeditious execution of the project.

JAPANESE TIE-UP FOR SUDARSHAN CHEMICALS

The Sudarshan Chemical Industries Ltd. (SCI) located at Pune has signed a collaboration agreement with Dainippon Ink and Chemicals Inc. (DIC). This is the first such tie-up with a Japanese company in the field of chemical industry involving not only transfer of latest technology on a continuous basis, manufacture of high performance pigments, better research and development management, energy conservation and export market development, but also participation in equity of SCI. DIC has taken about 1,15,000 shares of Rs. ten each at a premium of Rs. 48 per share. The deal was signed in September 1989. SCI plans to invest Rs. 20 crores on modernisation and expansion of plants to produce a wide range of pigments, agro-chemicals etc. and spent another Rs. three crore for the upgradation of effluent treatment plants, replacing old and and worn-out machinery with up to date, sophisticated machinery. SCI, started in 1953 at Pune was shifted in 1966 to another site on the bank of Mula-Mutha river.

Rs.1,000-cr. gas field underutilised

A massive investment of Rs. 1,000 crores by the Oil and Natural Gas Commission (ONGC) with a 60 per cent foreign exchange component on south Bassein, the country's largest gas field, is proving unviable.

After having commissioned all production facilities, the commission is being forced to slow down the rate of production, rendering half the capacity idle.

The present rate of production from South Bassein is around 12 million cubic metres of gas a day as against the capacity of 20 million cubic metres a day. This is sought to be reduced by two or three million cubic metres a day with the increase in the associated gas production from Bombay High. The Bassein-Hazira pipeline is linked to Bombay High and a portion of the latter's production could be diverted through it.

The government had given ONGC a production target of 18 to 20 million cubic metres of gas a day from this field by the end of the seventh plan. To meet this target, ONGC installed two process complexes, BPA and BPB. The four platforms, living quarters for 250 people and a pipeline to Hazira and Bombay High. South Bassein was expected to feed all the six gas-based fertiliser projects coming up along the HBJ gas pipeline, three power projects and a number of other downstream industries like the Saleempur aromatic project. Three of the six fertiliser projects are still languishing. So is the Kawas power project. The other downstream industries are not expected to come up in the immediate future.

Top ONGC sources say that with the present level of production, the commission is unable to service the loans taken for the project. It is now examining the feasibility of exploiting the thin column of oil in the field. The total oil reserves in south Bassein is put at 100 million tonnes which will enable ONGC to produce at the rate of one million tonnes of oil per annum. This will boost the revenue from the field.

It now appears that the entire investment on south Bassein could have been shelved for a decade had there been a proper gas utilistion policy. ONGC sources acknowledge that 15.5 million cubic metres of gas is being flared every day from western offshore. This is three million cubic metres more than the present rate of production from south Bassein field. In value terms, it works out to Rs. 750 crores per annum. Bombay High produces about 27 million cubic metres a day and satellite fields such as Heera, Panna, Ratna and D-18 about 2 million cubic metres. With south Bassein, the total gas output from western offshore is 41.66 million cubic metres a day.

Total supplies to various agencies like the Gas Authority of India Ltd (GAIL), Tata Electric, RCF, Maharashtra State Electricity Board, Deepak Fertilisers, Bharat Petroleum, Bharat Electronics, and Kribhco work out to 23.245 million cubic metres a day. Internal consumption by ONGC accounts fo 2.96 million cubic metres a day. The rest is being flared for lack of demand.

ONGC can slow down production from south Bassein because it is free gas. But in Bombay High it is associated gas, that is, gas coming along with oil, the production of which can neither be prevented or slowed down so long as oil is produced, the rate of flaring will come down in coming years, but gas worth thousands of crores of rupees has already been flared over the years.

With gas-oil ratio (GOR) going up with the depletion of the field, Bombay High is expected to produce more associated gas in future. The GOR has gone up from 100 to 450 (volume by volume) and advanced planning for gas utilisation was not taken when ONGC embarked on accelerated oil production in the early 80s.

FERTILISERS, PETROLEUM: SHARP RISE IN IMPORT VALUE

There was a sharp increase in the value of imports of fertiliser, iron and steel, petroleum and petroleum products, in April-August over the same period last year.

According to the provisional commodity-wise import-export data an increase of 182 per cent in the import value of fertiliser was recorded which was Rs. 705.54 crores compared with Rs. 250.23 crores in the first give months of the last financial year.

The total import bill for April-August was up by 18.5 per cent at Rs. 12,797.56 crores against Rs. 10,797 crores in the same period last year.

The import of petroleum and petroleum products showed an increase of 19.3 per cent at Rs. 2,140.65 crores compared with Rs.1,794.4 crores.

The import of organic and inorganic chemicals, however, declined marginally to Rs. 703.97 crores from Rs. 729 crores.

On the export front, chemicals recorded considerable growth. Total exports during this period were higher by Rs. 38.1 per cent at Rs. 10,100.4 crores compared with Rs. 7,313 crores.

Textile exports, on the other hand, forged ahead by 33.8 per cent at Rs. 1,909 crores compared with Rs. 1,426.45 crores

The export of leather and its manufactures rose by 17.6 per cent at Rs. 676.4 crores compared with Rs. 574.96 crores. Exports of chemicals and allied products spurted by 78.4 per cent at Rs. 968.8 crores compared with Rs. 543 crores.

ONGC hikes Cauvery crude output target

Oil and Natural Gas Commission (ONGC) has raised the production target of crude from the Cauvery basin during the Eighth Plan in view of the recent significant' discoveries of hydrocarbons in the region.

Such significant strikes of hydrocarbons have been made in the onland and offshore parts of the basins. On the basis of these, ONGC has hiked its terminal year target of crude production there for the Eighth Plan (1994-95) from two million tonnes per annum to 3.5 million tonnes annually, official sources said.

Meanwhile, production of crude from the basin from April to September 1989 "steeply increased" from 200 tonnes per day in the beginning of April this year to 700 tonnes daily at the end of the period. The earlier target of production for 1994-95 was two million tonnes per annum, the sources said.

The entire production from the Cauvery basin is being sustained through the "early production systems" at Narimanam, Bhuvanagiri, Nannilam and Adiyakamangalam. The development scheme for many of these structures is being worked out at the Institute of Reservoir studies in consultation with the reservoir engineers of the region, the sources said. Drilling was now in progress at five new structures — Kaudayur Needamangalam, Vattikadu, Mongudi and Kotarkudi onland. A number of exploratory locations with similar objectives have been identified after critical review and will be taken up for drilling. The number of rigs deployed in the Cauvery onshore and offshore is expected to be increased to 16 at the end of the Eighth Plan in 1994-95 from the existing ten, the sources said.

The development of the Cauvery offshore structure is also being taken up in a phased manner. A detailed Rs. 325 crore scheme has been prepared for the PY-3 structure in the basin, the sources said.

Rs. 50-Cr. SPANDEX UNIT: PETROFILS TIE-UP WITH JAPANESE CO.

Petrofils Co-operatives Limited has entered into a foreign collaboration agreement with Marubeni and Toyobo Co. Limited of Japan for its Rs. 50-crore spandex plant.

Under the agreement, the Japanese collaborators would supply technical know-how, basic engineering and equipment, as well as supervise detailed engineering construction and commissioning of the plant. The Japanese have also agreed to provide training to technical personnel of Petrofils in their Japanese plant.

The spandex plant, which is expected to go on stream in June 1992, will be the first to be set up in the country. The technology for spandex is generally guarded and difficult to get.

Spandex is an elastromeric yarn with wide applications in elastic tapes, sports wear, socks knitting, medical application, etc. It primarily replaces heat-resistant rubber used in these products.

It is an elastic yarn which retains its shape and size even if it is stretched six times. Unlike heat resistance latex rubber, it can resist higher temperature, effect of sunlight and in chemical inertia. It can also be dyed. The life of garments would be two or three times longer and the garment would retain shape without deformation.

The plant is being set up by Petrofils in the backward adivasi area at Naldhari in Bharuch district of Gujarat adjacent to the nylon and polyester plants.

The nylon-6 plant was commissioned in March. The foreign collaboration agreement for technical know-how, basic engineering and supply of equipment have also been signed. Civil works have just commenced and the plant is expected to be commissioned in 1991.

Tata Chemicals

Tata Chemicals which ranked 14th among the 101 private sector giants during 1987-88 has recorded peak sales and profits during the year ended March 1989 — the golden jubilee year of the company, the company which pioneered soda ash production, has kept up the leadership over the years in the organised sector. At present, it commands 62 per cent share of the aggregate soda ash production.

Although production of soda ash and other chemicals has been marginally higher than that achieved during 1987-88, most of the plants have reportedly worked at more than 100 per cent of their rated capacity — soda ash plant achived a capacity utilisation of 125 per cent.

The net sales realised at Rs. 226.7 crores recorded an increase of 25.8 per cent over the Rs. 180.2 crores of the previous year. The company achieved record sales soda ash-nearly 9.6 per cent more than the 5.49 lakh tonnes of the preceding year — despite a glut situation in the market. It also registered record sales of sodium bicarbonate —an increase of nearly 69 per cent over the 21,011 tonnes achieved in 1987-88.

During the year under review, the company exported 39,000 tonnes of both iodized and non-iodized vacuum evaporated salt and earned foreign exchange worth Rs. 4 crores.

The company earned gross profits (depreciation plus profits before tax) of Rs. 67.8 crores, arise of 31.3 per cent over the gross profits of Rs.51.7 crores in the previous year. The gross profits before intrerest but after depreciation have also been higher at Rs. 85.9 crores than Rs. 70.6 crores in the previous year. Profits before tax touched a new high at Rs. 50.3 crores (an increase of 42.9 per cent) against Rs. 35.2 crores in the previous year. The profits (after ta at Rs. 35.8 crores showed an improv ment of 31.6 per cent over the profi of Rs. 27.2 crores in 1987-88. Accor ing to the company, 'such record resul consistently achieved year after year f several years now and often in def nance or exceptionally heavy odds, a a true measure of the inherent streng which has been built up in a self-relia manner.'

The gross profits (profits before ta plus depreciation) as a percentage o total capital employed work out high at 11.75 per cent in 1988-89 than th 10.56 per cent of the previous yea Gross profits as a percentage of net sale have increased from 28.66 to 29.9 However, the profits after tax as a per centage of net worth work out lower a 13.99 than 14.50 mainly because of sharper increase in net worth.

The company paid a dividend o Rs. 3.10 per share, against Rs. 3.00 i the previous year. The payout ratio ha been stagnant at 39 per cent in both the years. The Rs. 10 paid-up shares are currently quoted at Rs. 115.50 on the Bombay stock exchange. Equity prices moved up between Rs. 113 (low) and Rs. 127 (high) during 1989. Against this, the prices had fluctuated between Rs. 56 (low) and Rs. 119 (high) in 1988.

The company so far had capitalised Rs. 13.05 crores from resources and issued bonus shares five times in various proportions. It also made rights issues four times amounting to 3.14 crores. As a result, the company ranks among the top ten private sector companies in terms of market capitalisation.

The company has proposed to capitalise Rs. 24.59 crores from the share premium account and issue bonus shares in the ratio 1:2 subject to necessary consents.

The equity-capital of the company as at the end of March 1989 stood at

s. 44.92 crores and reserves and sur-us at Rs. 210.93 crores. Loans secured ther than debentures) and unsecured ve been Rs. 38.22 crores and s. 43.52 crores respectively. Deben-res and bonds amount to Rs. 127.13 ores as against the current liabilities Rs. 62.60 crores, the current assets d loans and advances amount of s. 184.96 crores. The gross block at s. 285.59 crores has shown an increase 9.9 per cent over the previous year. he accumulated depreciation has been s. 121.25 crores.

During the year under review, Tata ertilisers was amalgamated with the ompany. The amalgamation will nable the company to enlarge and iversify the operating base at an excep-onally low increase in the share capital.

The book value and earning per share s at the end of March 1989 work out t Rs. 58.86 and Rs. 7.97 respectively. he price earning ratio has been 14.49.

GSFC PLANS EXPANSION

The Gujarat State Fertiliser Company (GSFC) is putting up a new phosphoric acid plant with a production capacity of 250,000 tonnes per annum. To be located at Sikka in Jamnagar, it is estimated to cost Rs. 300 crores.

The plant comprises part of the ambitious Rs. 1200 crores diversification and expansion plan of the company.

A new sulphuric acid plant of 1,000 tonnes per day capacity is also being set up at cost of Rs. 28 crores as a part of the expansion programme.

The company is also setting up a new caprolactum plant of 50,000 tonnes per annum at a cost of Rs. 400 crores. The basic engineering work has already been completed and civil work is in progress. The plant is likely to be commissioned by December 1991.

The company which is the only one to have a melamine plant is going in for a second plant at a cost of Rs. 73 crores. The plant to be located at Baroda will have a capacity of 10,000 tonnes per annum.

Work on the second phase of 25mw capacity steam and cogeneration plant costing Rs. 38 crores is also progressing fast and commissioning is expected by March 1990. The first phase of the plant with 15 mw capacity has already been commissioned at a cost of Rs. 33 crores.

According to Mr. P. V. Swaminathan, Managing Director, the company is the first in the country to go in for a joint cogeneration plant in collaboration with the Gujarat Alkalies and Chemicals Limited (GACL), Petrofils, IPCL and the Gujarat Electricity Board. The plant will cost Rs. 200 crores and generate 135 mw of power. GSFC will get about 40 mw. With the full commissioning of the plant, he said, the company would be practically independent of the GEB for its power needs. The company has pumped Rs. 40 crores in the company set up for the purpose, namely Gujarat Industries Power Company (GIPCO). He said this comprised 30 per cent of the equity. GEB had contributed 25 per cent and the balance is accounted for by the rest.

Mr. Swaminathan said the company had also promoted Gujarat Nylons Limited with a capacity of 6,000 tonnes of nylon filament yarn at a cost of Rs. 120 crores. He said the company had also stepped up its marketing drive and the turnover had been going up steadily. Last year, it crossed Rs. 650 crores. He said fertilisers accounted for only 70 per cent of the company's turnover. The rest is accounted for by other chemicals. He said the company had not only entered the biotechnology field but also had already started commercial production of biofertilisers. Sales in the current year were expected to be over Rs. 40 lakhs.

Chemplast maintains dividend

Chemicals and Plastics India Ltd. (Chemplast) has maintained the equity dividend at 16 per cent on the capital enlarged by one for one bonus issue as well as the amalgamation with Mettur Chemicals. As a result the outgo on the proposed dividend has risen from Rs. 87.22 lakhs to Rs. 141.97 lakhs.

Sales and other income for the year ended March 1989 rose to Rs. 114.86 crores from Rs. 53.41 crores. The gross profit also jumped to Rs. 22.25 crores from Rs. 10.70 crores. After providing interest of Rs. 734 lakhs (Rs. 482.70 lakhs), machinery lease rental charges Rs. 330.57 lakhs (Rs. 4.35 lakhs), depreciation Rs. 405.55 lakhs (Rs. 311.41 lakhs) and taxation Rs. 180 lakhs (Rs. 43 lakhs) the profit stood at Rs. 575.36 lakhs (Rs. 228.46 lakhs).

Taking into account the amount transferred from investment allowance reserve amounting to Rs. 32.60 lakhs (Rs. 15.38 lakhs), the balance profit brought in from previous year of Rs. 56.84 lakhs (Rs. 131.88 lakhs) and other adjustments, the amount available for appropriation worked out to Rs. 665.04 lakhs (Rs. 385.47 lakhs).

Of this, the amount transferred to general reserve is Rs. 44 lakhs (Rs. 23 lakhs), investment allowance Rs. 95 lakhs (Rs. 88 lakhs) and debenture redemption Rs. 129.33 lakhs (Rs. 100 lakhs). The profit carried over is Rs. 54.74 lakhs (Rs. 87.25 lakhs).

Following the amalgamation with Mettur Chemicals, Chemplast has emerged as the No. 1 producer of chemicals in the south. With a broadly diversified range of products, the company's operations are organised into six divisions viz., PVC division, caustic-chlor division, solvents divisions, mettron division, water treatment chemicals division and fine chemicals division in addition to the businesses carried on by the subsidiaries — Urethanes India Ltd., Peroxides India Ltd. and Metkem Silicon Ltd. This diversity in operations is considered insurance enough against the uncertanities of business cycles.

Production of PVC for the year was lower at 18,065 tonnes (19,159 tonnes) as the operations were suspended for a month in March, 1989 following labour unrest. There was trouble in the first few months of the current year as well. The situation became normal last June.

With satisfactory supply of alcohol and chlorine, production of EDC was maintained at required levels.

With indigenous production of PVC continuing to lag behind demand, large quantities are still being imported. Import prices have of late dipped sharply, forcing a downward realignment of domestic prices.

Referring to the Supreme Court judgement striking down the right of the State Governments with regard to control and taxation of industrial alcohol, the directors' reports say that the outlook for alcohol-based industries has thus been rendered more stable than at any time in the past few decades.

The Tamilnadu Government has cleared the company's proposal for expansion of capacity at the industrial alcohol plant at Panruti and sanctioned the necessary quota of molasses. The company proposes to install a modern plant for the enhanced capacity at a cost of about Rs. 4.5 crores.

While the installed capacity for PVC is 30,000 tonnes per annum, capacity in certain sections of the monomer plant are limiting. The company is undertaking a major expansion of the monomer section and concurrently expanding its capacity for manufacture of speciality resins. Investment in these projects is estimated at about Rs. 17 crores.

Production of caustic soda during the year was 36,978 tonnes (33,436 tonnes) with corresponding improvement in chlorine production to 33,222 tonnes from 29,979 tonnes. The company exported 1,251 tonnes of caustic soda.

Metkem Silicon Ltd. has become a subsidiary of the company consequent to the scheme of amalgamation. The low volume of operations due to poor offtake of products has affected its performance. However, with the emphasis placed by the Government on solar energy, the company expects to improve its working.

The outlook for the current year is fair enough. Sales and other income for the six months ended last September was Rs 5,414 lakhs and the gross profit Rs. 1,163.56 lakhs. After providing Rs. 396.12 lakhs for interest, lease rent Rs. 126.53 lakhs and depreciation Rs. 289.75 lakhs, the profit before tax was Rs. 351.16 lakhs.

UNICORN ORGANICS

Unicorn Organics Ltd. has received the CCI consent for the issue of rights shares of Rs. 10 each at par in the ratio of three shares for every five shares held aggregating Rs. 1.88 crores and the company has fixed January 11, 1989 as the record date for determining the rights entitlement. The rights issue will open on January 15, 1990 and the earliest closing date is February 14.

Meanwhile, the company has already commenced commercial production of sorbitol from November 1989 and has already achieved 90 per cent of its installed capacity and started earning cash profits.

The company is in process of doubling its production capacity to 7,200 tpa as planned earlier.

It is also, diversifying into the manufacture of mannitol and anhydrous dextrose, at a project cost of around Rs. 1.79 crores.

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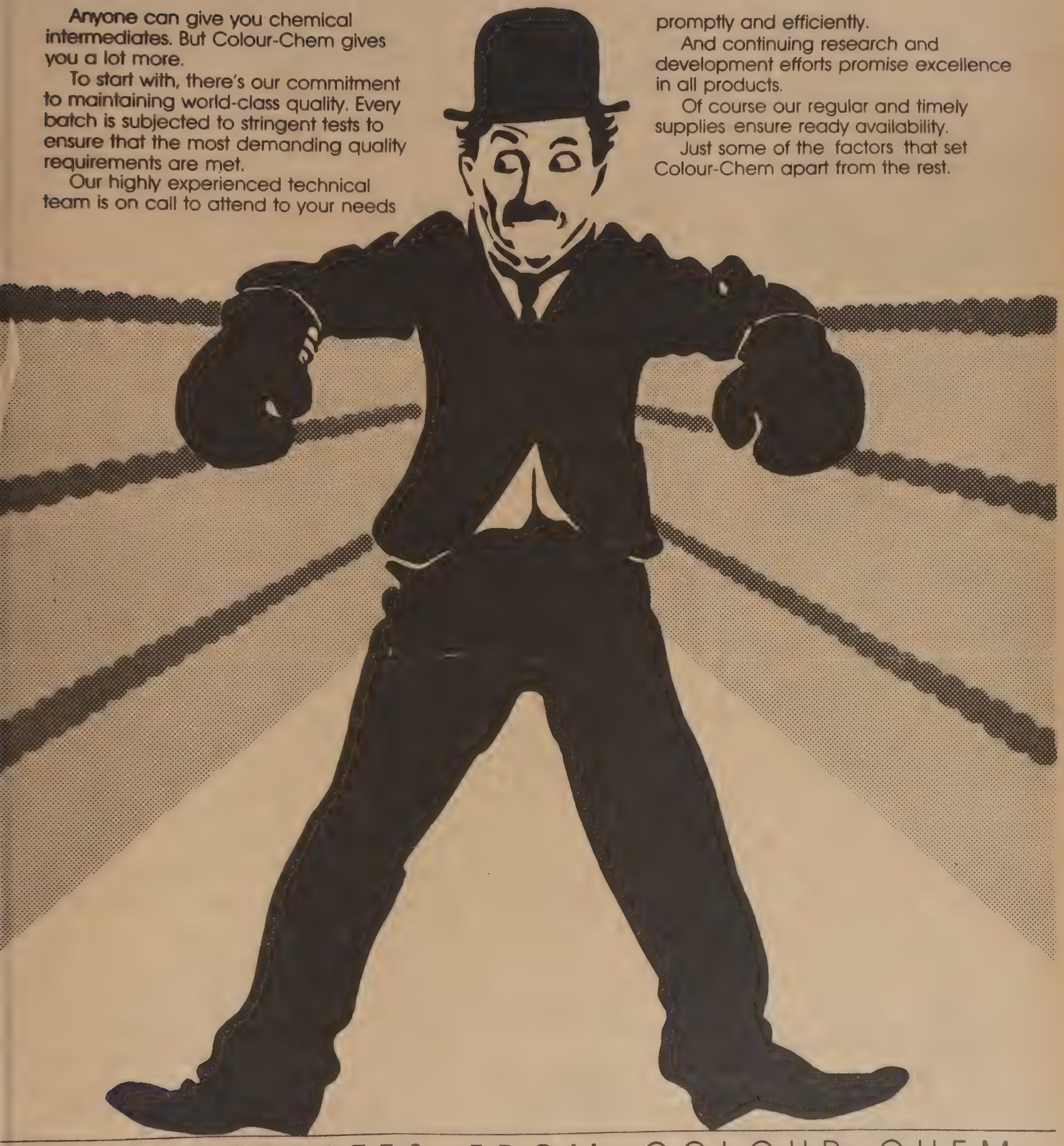

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HTA 1531

Highlights in Chemical Technology (Part 1)

A NEW PROCESS FOR TETRAHYDROFURAN (THF) UNVEILED BY B.P. CHEMICALS INC. (USA)

B.P. Chemicals Inc. has recently unveiled a new process for tetrahydrofuran (THF) as a spin-off from the proprietary maleic anhydride technology. The new process of the company claims to produce THF in yields above 95% via direct hydrogenation of maleic anhydride at around 250°C and 40 bars pressure.

The Company is also working on a similar process for gamma butyrolactone (GBL). The company logically thinks that with maleic anhydride quite a bit cheaper by its proprietary process, it makes sense to make derivatives such as THF and GBL, which are normally recovered as by-products of butanediol production. (*ECN*, 11/6/89, p. 28)

B.P. CHEMICALS DEVELOPS PROPANE TO ACRYLONITRILE TECHNOLOGY

B.P. Chemicals Inc. (USA) is pushing ahead with development of a route to acrylonitrile direct from propane. Commercialization, which would sever the dependence of acrylonitrile producers on propylene feedstock, is expected by the mid 1990s.

Conventional manufacture of acrylonitrile is by aminooxidation of propylene. The key to the new process is in development of a proprietary catalyst which produces the fibre in one-step from a mix of propane, ammonia and oxygen. Dehydrogenation of the propane and ammoxidation of the intermediary propylene occurs almost simultaneously.

The new process is being tried out in Cleveland, Ohio, in a pilot reactor 'only inches in diameter' reports B.P. Chemicals. Plans are a foot to build a larger pilot plant in Cleveland in 1990.

Interest in the new process has heightened because of hikes in propylene prices. Only recently have propylene premiums been high enough and consistent enough to justify the added process costs. (*ECN*, 11/6/89, p. 28)

A NEW PLANT AND A NEW ROUTE FOR PIVALIC ACID

The new Shell Nederland Chemie's pivalic acid plant at Pernis near Rotterdam was opened last October. It cost $72.5 million and has a capacity of 10,000 ton/year.

The Pernis plant utilizes the conventional Koch process, in which an olefin is carboxylated at high temperature and pressure using a Lewis acid liquid phase catalyst. Besides pivalic acid, the plant is also capable of manufacturing other neoacids, including 2-ethyl-2-methyl butanoic acid, 2,2, dimethylpentanoic acid and neo-decanose acid.

BASF, which currently buys its pivalic acid, has also recently patented an alternative process employing a heterogenous Zeolite-type catalyst. The W. German Company declined to give details or reveal whether it would commercialize the process. (*ECN*, 11/6/89).

A NEW FLAMELESS WASTE DISPOSAL TECHNOLOGY ON THE HORIZON

The US based engineering contractor Lummus Crest last October entered into a long-term agreement with Modar (Houston, Tex) to commercialize a new flameless waste disposal technology that could challenge high-temperature incineration.

The new Supercritical Water Oxidation (SCWO) technology pioneered by Modar holds promise in treating wide range of hazardous chemical wastes including polychlorinated biphenyls, chlorinated dibenzo-p-dioxins, di-nitro toluene and pesticides.

The two companies are already working on the design and engineering of 20,000 gals/day plant and plan future units in the 10,000-1,00,000 gals/day range. Operating costs are estimated at one-tenth those of conventional incineration.

The SCWO process makes use of the fact that water in its supercritical state (above 274°C and over 218 atm) is an excellent solvent for both organics and oxygen. By contrast inorganic salts are only spraingly soluble.

Hydrocarbon wastes treated with oxygen in supercritical water rapidly break down to carbon dioxide and water. Heteroatoms, such as halogens, phosphorus and sulfur, if present are converted to weak acids which in turn are neutralized by the addition of appropirate cations to form inorganic salts. These can be separated out and removed in the form of a concentrated brine.

In pilot plant testing destruction efficiencies as high as 99.99999 per cent are reported, depending on the concentration of organics in the waste. Because SCWO environment is flameless, the process will not require a hazardous waste incineration permit under the UD Resource Conservation & Recovery Act.

Lummus Crest sees SCWO process an an alternative solution to many current hazardous waste destruction processes, which are under environmental attack or do not inert regulatory standards in USA. (*ECN*, 10/30/89, p. 23)

IDEMITSU (JAPAN) DEVELOPS NEW CS RESIN PRODUCTS BASED ON C-5 PETROLEUM-RESIN TECHNOLOGY

Japan's Idemitsu Petrochemicals is

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Japan's Idemitsu Petrochemicals is

reported to be close to commercializing high value added products based on its C-5 petroleum resin technology.

The company has developed a technology to produce a range of transparent-grade hydrogenated petroleum resins aimed at the expanding market for hot-melt adhesives, such as those used in disposable diapers.

The company is also understood to be commercializing acrylic acid, acrylic esters and bisphenol A and building up its operations for oligomer chemicals. (*ECN*, 10/30/89, p. 24).

A WORLD'S FIRST PNEUMETIC PUMP ENTIRELY MADE OF TEFLON

The French company Asti recently unveiled a novel pneumetic pump for highly aggressive and ultra-pure fluids, which is entirely made from Du Pont's Teflon PFA fluorocarbon resin. Called the PFD-2 pump, it is made up of two sub-assemblies for the air and fluid circuits. Pumping is done by two turn PTFE bellows that move in opposition for a smooth outflow of fluid. Design options were made to rule out all dynamic gaskets and to avoid friction and the need for lubrication. The average pumping rate of one stroke/sec. permits vibration free operation. PFA resin is suitable for injection moulding and thus is cost effective for Asti as complex machined assemblies can often be replaced by single injection moulded elements. Hence the number of parts in the new pump is lower than in earlier PTFE models.

The company adds that the pump is also reliable and practically leak-free. For further information contact : Asti, Courbeooie, Paris, France.

'CHEMELEON' TEXTILES ON THE HORIZON

Fabrics that change colour with changing temperatures are tradenamed Sway UV by Toray Industries (Japan). Blue or violet patterns invisible indoors appear instantly when the fabric is exposed to sunlight and fade again in half a minute when the light is removed. The photochromic dyes causing the effect are compatible with all textiles natural or man-made and are wash-fast and light stable. When yellow and red are added to the range the company will be well on its way to a stated business objective 'chemeleon' textiles.

These photochromic dyes and their relatives were the subject of presentation by H. G. Heller at a 1988 mini-symposium in Oxford. Heller recognized their 'enormous commercial potential' and suggested their use in optical information storage applications; in lightweight plastic lenses and in security printing of banknotes, cheques and other documents. He also pointed out that the origin of 'chameleonic' materials rest on the Woodward Hoffmann rules — facile photo-stimulated conrotatory reactions coupled with sterically inhibited and slow thermal disrotatory reactions. (*Jpn. Chem. Week.*, (1989), 30(18), 1501, *Ange W. Chem. Intl. Ed. Engl.*, 1988, 27(12), 1763).

POLYETHER ETHER KETONE (PEEK) A GOOD POLYMER FOR STORAGE OF ULTRAPURE WATER

To keep ultrapure water pure, use polyether ether ketone (PEEK) tubing. This polymer will not support microorganism growth, has fewer extractables, does not embrittle with time, is resistant to hot water and chemicals and does not crack or deform in use, according to Mitsui Toatsu. (*US. Pat.* 4784772 Nov 15, 1988, *Chemtech*, 10/1989. p. 579)

CALIFORNIA PUSHES FORWARD METHANOL APPLICATIONS IN SEVERAL DIRECTIONS

California has established a new methanol reserve to ease the state's dependence on petroleum and help solve its air pollution problems.

The California 'Fuel Methanol Reserve', the first of its kind in USA will set aside nine million gels of methanol that planners hope will mark the establishment of a market for the relatively clean-burning fuel.

The reserve is sponsored by the California Energy Commission, which hopes to develp methanol as a viable alternative for fueling vehicles and generating electricity. The Commission wants to make the state more energy self-sufficient by relying on fuels derived from natural gas, rather than on imports of foreign oil from OPEC.

The Commission also sees methanol as a partial answer to air pollution. It anticipates stringent EPA fuel emission standards for diesel trucks beginning in 1992.

California being a trendsetter in environmental regulations, has taken several steps to encourage methanol development, including the use of 500 methanol fueled vehicles in the state's own fleet. The Commission's agreement with Ford and General Motors calls for those companies to produce 100,000 methanol fueled vehicles by 1992. The Commission also has sponsored a programme demonstrating the use of methanol in transit and diesel trucks. It installed recently the first retail methanol gas pump in Sacramento and also funded two projects run by an air quality group to generate electricity with methanol. (*Chem. Eng. Prog.* 6/1989, p. 4).

MELANIN PIGMENT INCORPORATED INTO SUNGLASSES

By 1990, Bausch & Lamb (Rochester, NY) plans to start selling sunglasses developed by their researchers, using synthetic melanin incorporated into the lenses. Consumers however, will have to pay a high price of around

$100 per piece.

Melanin is the pigment in skin and eyes that protects against UV-A and UV-B rays present in sunlight. Researchers point out that the amount of melanin normally present in the eyes decreases with age.

The sunglasses are expected to appeal to the health conscious rich consumers who will prefer this expensive but natural broad-spectrum protection from the sun's harmful UV radiation. Bausch & Lamb licensed the technology for incorporating melanin in plastic lenses from Photoprotective Technologies (San Antonio, Tex), but is hesitant to disclose how it is done. (*Chem Week*, 11/8/89 p. 44).

NEW HIGH-STRENGTH FIBRE (SPECTRA) SPAWNS NOVEL DEVELOPMENTS IN PROTECTIVE CLOTHING

'Spectra' a new high-strength fibre developed by Allied Signal of USA was recently reported as the world's strongest fibre. It is about 30 to 40% stronger on a weight basis than Du Pont's Kevlar aramid fibre, with which it will probably compete most directly.

The new fibre itself has been available commercially since 1985, but products made from it have been under development for the past few years.

The polyethylene plastic that Spectra is made from is the same as that found in milk cartons, garbage bags and plastic sandwich bags. Ordinary polyethylene is a flexible-chain macromolecule that normally crystallizes by folding, but the folded portions of the polymer chain contribute little to fibre strength, and polyethylene fibres made by conventional methods are therefore not very strong.

However, in the manufacturing process for the high-performance polyethylene used in Spectra, the polyethylene chains crystallize in an extended, highly oriented state. This extension of the polymer chain and the orientation of chains along the fibre axis give use to Spectra's high tensile strength and high modulus (stiffness), in addition to the molecuar weight of high-performance polyethylene (1 million to 5 million daltons).

One method of producing high-performance polyethylene fibre is the solution spinning process. The high molecular weight polymer is first dissolved in a solvent, that disentangles the polymer chains, a step that is critical for attaining the extended-chain structure. The resulting gel is viscous enough to be processed on conventional melt spinning equipment. The cooled exudate from the spinnerettes forms an extended-chain polyethylene fibre that is liberated from the solvent by drying or extraction and then drawn to induce additional molecular orientation prior to final packaging.

The high cut resistance of extended chain polyethylene fibre was discovered, when scissors to cut the fibre were found to wear out very early. The mechanism is not yet well understood.

The new fibre's chemical inertness also gives it poor matrix adhesion and makes it virtually impossible to dye it (it is naturally white).

Products based on Spectra that are currently available are in the development pipeline including glove liners to protect health-care workers from exposure to infectious agents, cut resistant industrial gloves, leg chaps to protect tree cutters from chain saw accidents, bullet-resistant vests for personal protection and law enforcement and rigid ballistic armour products such as riot helmets.

The Spectra-based surgical glove liner, expected to be available shortly, is a thin, sheer, light-weight glove designed to be worn beneath a latex rubber glove. The liner provides about 30-times the cut resistance of a latex glove and about 15 times that of a medium weight leather work glove. If provides protection to health workers from cuts that might introduce infectious agents including virus of hepatitis B and AIDS.

A second product an industrial glove is designed for use by Food processors (butchers or vegetable handlers etc.) and others in need of hand protection. In the case of bricklaying, stone handling or other tasks where a pair of leather gloves might be used for abrasion resistance or cut resistance, these gloves would do the same job and last a lot longer.

Another use of Spectra will be in bullet-resistant vests. Research indicates that it may give better protection than the Kevlar based vests.

Spectra fibre can also be used to make composites, in which the fibre is combined with a resin and then molded into rigid forms. Composite products being developed include military combat helmets and police riot control helmets. In the case of military helmets, the researchers at Allied Signal will endeavour to reduce the weight of the currently used aramid helmet by about 30%. (*C & EN*, 10/9/89, p. 23-24).

CARBON DIOXIDE TO REPLACE SOLVENTS IN SPRAY PAINTING

Researchers at Union Carbide (USA) have developed a process for spraying paint with carbon dioxide. The process is based on supercritical carbon dioxide. The process will replace conventional organic solvents (hydrocarbons such as alcohols, ketones, esters, glycols and chlorinated compounds) with carbon dioxide. These solvents are volatile organic compounds, which evaporate during spraying and react with nitrogen in the atmosphere, contributing to the photochemical smogs in urban areas. The pollutants also help to deplete the

ozone layer.

The process called UNICARB was developed by Union Carbide in collaboration with Marc Donaline a professor of chemical engineering at Johns Hopkins University. The key to the process is that carbon dioxide enters a phase between gas and liquid called supercritical, at temperatures between 35°C and 65°C and pressures above 8 mega pascals. In this phase, it acts as a solvent.

In the conventional solvent process 1 kg. of solvent is released into the air with every 2 lits of paint sprayed. In 1988, industries in USA sprayed more than 1.6 billion lits of coatings, releasing huge quantities of the toxic compounds into the atmosphere. In conventional techniques, the paint is diluted with solvents until it is thin enough to spray.

With UNICARB, solvent is added only until it is sufficient to hold the paint — a mixture of polymer concentrate, powder pigments and other additives in solution, though not enough to thin it for spraying. Instead, supercritical carbon dioxide is added to thin the paints to a sprayable consistency just before it is piped into the spray gun. The precise amount of solvents that are necessary depends on the type of coating.

The company emphasizes that the process will not create any new carbon dioxide. The gas is a by-product of oil refining and the production of ammonia and is also available in large quantities from natural gas wells. Although the process releases CO_2 into the air, the gas will not add to the greenhouse effect because it is recycled.

Although UNICARB works with existing equipment for spraying, the company reports that it will have to change manufacturing procedures because of the elimination of such large amounts of the solvents. The sprayers will be handling materials that are much more viscous, because the new process reduces solvents by 30 to 70% and the supercritical fluid is not added until application.

Union Carbide has worked with big companies that make coatings and other that spray paint on a large scale. It hopes to establish the first industrial installation in use by the end of 1989 or early 1990. The company is now developing a machine that will work in small job shops like body shops, furniture factories etc. The coming legislation on Clean Air in advanced countries will ensure good future for the UNICARB process. (*New Sci.*, 9/23, p. 35).

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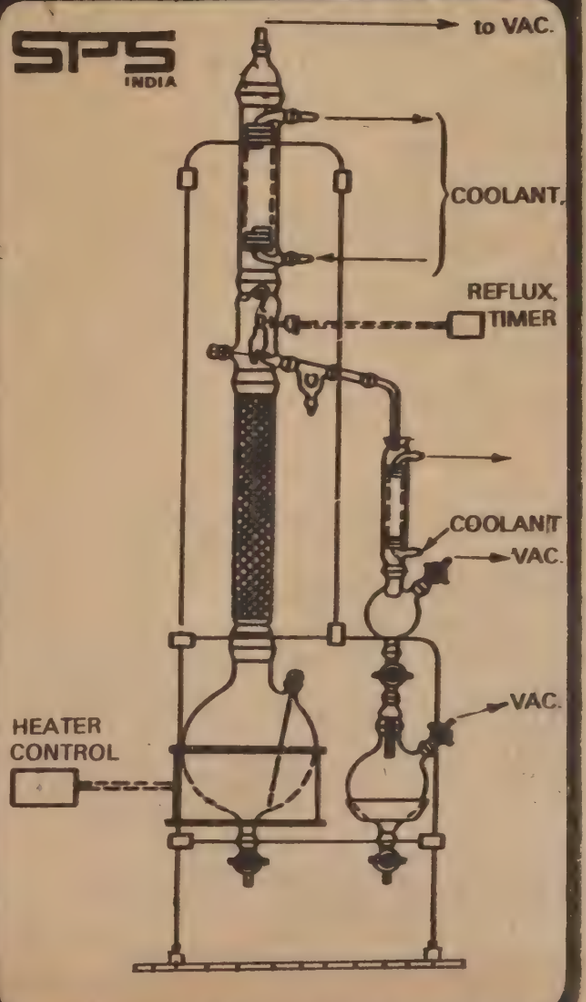

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Science Briefs

BITUMEN EMULSION FOR ROAD SAVING

The days of surfacing roads with hot molten bitumen are numbered with the development of emulsified bitumen that has paved the way for building "cold" roads at a faster pace.

Bitumen, used for surfacing roads, is a thick unworkable material that has to be heated and melted before it can be sprayed. But scientists at the IDL-Nitro Nobel Basic Research Institute (INBRI) in Bangalore have produced bitumen emulsion that remains in liquid form ready for spraying without any heating.

The advent of bitumen emulsion would mean an end to roadside heating of bitumen barrels, waste of fuel, and a lot of smoke and pollution that are now common at sites of road repair.

More important, according to Dr. V. Vedam, INBRI's chief executive, is that road work can be done faster since no heating is involved. Handling of the cold, liquid bitumen poses no hazards to workers and requires no heavy machinery, said Dr. Vedam.

One major advantage is that bitumen emulsion can be sprayed on wet aggregates even after a rain. Endowed with anti-stripping properties the emulsion prevents the aggregates from stripping out after a heavy rain.

Because the emulsion remains in liquid form right up to zero degrees Celsius, it can be used for road work in cold places. According to Dr. Vedam, the Border Roads Organisation has switched to emulsified bitumen and one of the trunk roads connecting Bangalore will soon be paved with the emulsion.

Having better penetration than bitumen, the emulsion is suited for spray applications like surface dressing and crack filling, it is claimed. The cost of bitumen emulsion is higher than bitumen, but the total cost of road work is claimed to be lower because of savings on fuel, absence of handling loss, and reduction in labour for heating.

Besides, the drums containing the emulsified bitumen can be re-used unlike the bitumen barrels that have to be thrown away. Another innovation by INBRI scientists is a ready-to-use premix made with a speciality binder and aggregates for instant filling of cuts and pot-holes on road surfaces. It is claimed to be ideally suited for maintenance of internal roads in housing colonies and for prompt repair of cuts made on roads by telephone, electricity or sewerage workers.

FLYASH REDUCES HEAVY METAL TOXICITY IN SOIL

There may be yet another use of the large amounts of flyash that are spewed out by thermal power stations -- reducing heavy metal toxicity in soils. According to preliminary indications of studies conducted by soil scientists at the Indian Agriculture Research Institute (IARI), New Delhi, alkaline flyash may reduce heavy metal toxicity in soils by making ions of these metals unavailable to plants.

Amongst the major heavy metal pollutants in soils are lead, cadmium, iron and manganese. Large amounts of lead compounds are emitted by automobiles and cadmium is released by zinc-smelting industries.

While heavy metal pollution of Indian soils is not alarming at present, the cumulative effects over a longer period may be more dangerous, Dr. R. K. Rattan, senior scientist at the division of soil science and agriculture chemistry at IARI, said.

One significant finding of the IARI team is that it is the alkaline flyash that reduces the availability of heavy metal ions to plants. This was indicated in studies where flyash from the Badarpur power station near New Delhi, which had a pH of 7.3, did not alter heavy metal toxicity, but flyash from the Ramagundam power plant in Andhra Pradesh, with a pH of 11, did.

Flyash essentially contains ferro alumino silicates. Alkaline flyash also contains free sodium and potassium oxides. When these free oxides come in contact with the water present in the spaces between soil particles, they form hydroxides immediately.

The hydroxyl ions present in these hydroxides help to neutralise the hydrogen ions present in soils rendered acidic due to the presence of heavy metal ions, Dr. Rattan explained. So, it might be more inexpensive if alkaline flyash could be used instead of the conventional lime to treat acidic soils, Dr. M. B. Kamat, head of the division, said.

Dr. Kamat however cautioned that the experiments were conducted at a laboratory level in pots so far, and field trials have not been conducted to verify the results on a large scale.

FRUIT AND VEGETABLE WASTES -- YIELD BIOGAS AND MANURE

An ordinary tomato can not only be squeezed and mashed to make jam, pickle and sauce, but further exploited to yield energy and still hold some use as a soil enricher.

Researchers at the Indian Agriculture Research Institute (IARI), New Delhi, say fruit and vegetable wastes can be used to yield biogas, and the biogas slurry in turn can be used to enrich the soil.

Hundreds of tons of such wastes are generated daily in fruit and vegetable processing industries involved in making jams, pickles and sauces. Dis-

posal of these wastes, which amount to 10 to 50 per cent of the raw material input, creates economic and environmental problems. Although some of them can be used as cattle feed, many rot within a short period of time and are unfit for consumption by cattle. Generally, they are dumped as landfill, which may lead to land, water and air pollution.

Recently, however, scientists at the division of soil science and agriculture chemistry in IARI have found these wastes to be a potential source of biogas. A team carried out anaerobic digestion of wastes of apple, pears, banana (skin and stem) and Indian squash ('tinda' in Hindi), with and without cowdung, at around 34 degrees Celsius and near neutral pH (between 6.5 to 7.5). Acidic wastes were pretreated with 0.3 per cent sodium hydroxide solution before digestion.

The team found that the fruit and vegetable wastes by themselves generated only small amounts of biogas. While banana skin and Indian squash yielded only about a quarter of the biogas generated by cattle dung which was used as a control, banana stem gave about 60 per cent, Dr. M. C. Jain, senior scientist at the division said.

Compared to 180 to 200 litres of biogas generated per kg of dry matter in the case of cattle dung, apple wastes gave 100.5 litres, banana skin 50.6 litres and banana stem 143.9 litres.

But supplementation with cowdung improved yields by as much as 34 to 77 per cent, Dr. Jain said. The total gas yields from mixtures of cowdung (added in 1:1 or 1:3 proportion) and various fruit and vegetable wastes ranged between 183.2 and 253.5 litres per kg of dry matter, with the methane content varying between 56 and 64 per cent, he added.

Another interesting finding of the IARI team is that the biogas slurry can be used to enrich soil. Ongoing studies at the division show that the spent slurry can replace upto 40 per cent of the urea requirement in a field.

The digested slurry coming out of the biogas plant has been found to be superior to farm yard manure as far as nutrients and capacity to improve the physical properties of soil are concerned.

Experiments conducted in plots of size 2m x 2m show that sun-dried slurry gives better results than wet slurry.

The IARI team also conducted field trials in 7m x 7m plots in the institute and found that production of wheat and maize crops increased after applying the sun-dried spent slurry to the soil. "Wheat production in fact improved by as much as 58.8 per cent," Dr. Jain said.

But, he cautioned, the slurry can replace only upto 40 per cent of the urea requirement in a field. Both wheat grain and straw yields decline with slurry substitution beyond 40 per cent.

In plots receiving about 80 per cent of nitrogen through slurry, the potassium availability improved, as did the status of micronutrients like zinc, copper, manganese and iron.

OPEN WIDTH VACUUM HYDRO EXTRACTION FOR TEXTILES

Textile engineers in Maharashtra have invented a device for the removal of process liquor from wet fabric, which is not only highly efficient but also saves 40 to 50 per cent thermal energy.

The open-width vacuum hydro extracter has fetched Dr. N.S. Mehta and Dr. M.M. Chandekar of the Primatax Machinery Limited, Thane, a National Research Development Corporation award of Rs. 25,000. They reported the details of the unit in the journal "Invention Intelligence".

Generally, during the processing o simple woven fabric to a marketable fin ished fabric, it is passed through a serie of chemical solutions and finishing agents. After each such treatment, the fabric has to be dried to make it suitable for the next treatment, which requires a large amount of thermal energy.

There are two types of moisture present in a fabric during wet processing. One is the bound moisture which is attached to the fabric by hydrogenic bonding and which can be removed only through thermal energy. The other is the unbound moisture which is mechanically entrained in the fabric due to surface tension and is present within the interspaces. It can be removed using mechanical energy -- squeezing or vacuum extraction.

The proportion of bound and unbound moisture varies with the fabric quality, its blend and weaving pattern. The amount of unbound moisture which can be removed mechanically is very high. Since the thermal removal of the bound moisture is costly, textile technologists endeavour to remove the maximum unbound moisture.

Moisture removal by a vacuum hydroextractor is achieved by passing the wet fabric in open width condition over a fine slit provided on a vacuum chamber which is being continuously evacuated with a vacuum pump. Because of differential pressure on either side of the fabric caused by the vacuum underneath the chamber, air is sucked through the fabric and the slit underneath a very high velocity and it carries the moisture with it. The amount of moisture removed depends on the permeability of the fabric and suction capacity of the vacuum pump.

The Thane scientists have improved upon this basic concept. The moisture-air mixture drawn in a vacuum chamber is separated in a separator where the mixture is collected at the bottom and

he dry air is sucked off by the vacuum pump. The unit is also provided with an automatic liquid recovery system where the liquid collected at the bottom of the separator is automatically drained out to the atmosphere so that expensive chemicals used in the process are available for reuse.

Slit openings for a cloth of a particular width remain partly uncovered while processing fabrics of smaller width. This results in drawing of maximum air from the uncovered slit portion due to absence of resistance. To get optimum results, it is therefore necessary to cover the unused portion. The new unit is provided with an automatic slit sealing device which senses the fabric edges and repositions the sealing belt to cover the unused portion of the slits.

PETROCROPS: ENERGY PLANTS OF THE FUTURE

Petrocrops, plants that yield petroleum-like hydrocarbons naturally, may reduce the country's energy bills in the future and take the pressure off petroleum in a number of industries.

These plants, also called hydrocarbon plants or energy plants, contain a number of chemical constituents which can substitute for petroleum and petroleum-based products. These hydrocarbons are chemically more reduced than the normal hydrocarbons found in other plants, and can therefore, be used directly unlike the carbohydrates which have to be either microbiologically degraded or thermochemically converted before use.

The Department of Non-Conventional Energy Sources (DNES), New Delhi, in collaboration with some universities and research institutes, has identified about 355 species of such potential energy plants. Most of them belong to five or six families in the plant kindom -- Euphorbiaceae, Apocyanaceae, Asclepiadaceae, Urticaceae, Convolvulaceae and Sapotaceae. These latex-bearing groups grow extensively in India, particularly in the arid zones and wastelands, Dr. H.L. Sharma from DNES said.

Extensive surveys in Andhra Pradesh have shown that petrocrops are abundantly available in Ranga Reddy, Nalgonda, Visakhapatnam, Srikakulam, Anantapur, Chittoor, Kurnool, Krishna and Guntur districts. Similarly a number of latex-yielding plants are seen in Alwar, Ranthambore, Jodhpur and Udaipur in Rajasthan; at Rohtak, Hissar, Surjpur and Kalka in Haryana; and at Bardoli, Bharuch, Ahmedabad and Pavagarh in Gujarat.

The plants grow under extreme conditions -- in infertile and degraded soils that have no surface layer, no nutrients and no organic matter. Not only do they thrive in such habitats that are unfit for agriculture, but they also support the growth of some grasses, thus offering an additional advantage of greening the land.

One such extremely promising plant is jojoba which yields an oil that resembles sperm whale oil and is a source of liquid wax. A native of the Sonaran desert of California and Arizona in the United States and Mexico, the plant has grown successfully under extreme saline conditions in India. It was introduced for the first time about two years ago in the coastal sandy soils and sandy loam soils in Visakhapatnam in Andhra Pradesh with 15,000 ppm of salt. It could also tolerate salinity levels upto 30,000 ppm, albeit with reduced yield. Scientists at the Central Salt and Marine Chemicals Research Institute, Bhavnagar, are evaluating the yield performance of 65 selected strains of jojaba, Dr. Sharma said.

One of the most significant findings in this context is the recent finding of the Indian Institute of Petroleum (IIP), Dehra Dun, that sulphurised jojoba oil is very much similar to petroleum.

The DNES projects encompass three basic parameters -- production and improvement of high-yielding hydrocarbon plants, conversion of these natural hydrocarbons to petroleum-like compounds and utilisation of these compounds. Keeping in view the importance of mineral nutrients in increasing the productivity of plants, the Department of Botany, Lucknow University, studied the effects of zinc, copper and manganese on two petrocrops, Euphorbia antisyphilitica and Calotropis procera.

The experiments revealed that addition of the three micronutrients increased the growth, biomass and the epicuticular wax yield of these plants. Zinc treatment, in particular, increased the wax concentration in Calotropis leaves.

The Department of Botany, Rajasthan University, also sponsored a project to develop agro-technology for selected petrocrops. Scientists found in their studies that treatment of cut twigs with cyocoel (CCC) and indole acetic acid (IAA) promoted maximum growth in the cuttings of Pedilenthus tithymaloides and Jatropha curcus. Spraying the plants with gibberellic acid favoured fruit setting and increased seed yield 2-3 folds, while application of 40 per cent farm yard manure led to maximum growth in these plants.

The latex samples vary at different times of the day and in different seasons. Latex collected in the morning contains more moisture, while is is more dense during August and September. It contains considerable amounts of carbohydrates, proteins, amino acids, ascorbic acid, alkaloids and phenolic compounds besides the hydrocarbons. The ether-extractable portion from the dry material has a better combustion value and scientists do not rule out the possibility of using some of these compounds either in liquid or in crystalline form as a source of fuel. Latex from Euphorbia species has potential to sub-

stitute for petro products. Studies at the Shriram Institute for Industrial Research in New Delhi, have shown that the latex can be used for making water-thinnable emulsion paint which is a petroleum-based product.

The latex can also be used for making composites with jute fibre or jute cloth. It can be moulded into sheets to serve as roofing material for huts and partitions in offices which at present use synthetic resins for making the composites.

Another significant finding relates to the use of non-edible vegetable oil as diesel fuel. Investigations by the Department of of Mechanical Engineering, IIT, Madras, show that blends of vegetable oils and diesel can serve as efficient fuels. Pure vegetable oils can be used in diesel engines only under emergency conditions when diesel is not available at all. This is due to the high smoke forming tendency of the vegetable oils. But 20 per cent blends are equal to diesel both in terms of efficiency and emissions. Equal blends of methyl esters of vegetable oils and diesel oils can also be used to extend diesel oil supplies. The studies have also confirmed that with minor modifications in the existing engines of vehicles some of these oils can reduce petrol consumption.

Cassava is emerging as another potential source of alcohol. A project sponsored by the 'Regional Research Laboratory, Trivandrum, undertook three major tasks: production of starch hydrolysing enzymes, hydrolysis of starch and conversion of starch hydrolysate into ethanol. The laboratory created a special solid-state fermentation facility (SSFF) to prepare the enzyme and optimise the process conditions. Experiments with 40-50 kg cassava flour in a 250 litre reactor are in progress.

Studies at the Central Salt and Marine Chemicals Research Institute, Bhavnagar, have shown that alginate wastes can also generate biogas during anaerobic digestion. More than 20,000 tonnes of alginate wastes are generated in India. They contain about 5-7 per cent dry matter which contains 72-73 per cent volatile matter and 27-28 per cent non-volatile matter. Experiments carried out for production of biogas using an anaerobic batch type digester recorded 1.5 to 2.0 litres of gas per kilogram of dry waste per day.

-- P.T.I. Science Service, Dec. 16-31 1989 (All above items)

INDIA MAKES STRIDES IN PLANT BIOTECHNOLOGY

Plant biotechnology is fast becoming an important area of agricultural research in India with greater focus on genetic engineering and tissue culture, says Dr. V.L. Chopra, head of the Biotechnology Centre at the Indian Agricultural Research Institute in New Delhi.

Genetic engineering includes fusions, deletions, inversions and transpositions of genes, but the most important of these is hybridisation of genes — grafting a piece of the DNA from one organism to the DNA of another.

Research in this technique, called recombinant DNA, got a boost after the discovery of plasmids and some other enzymes.

Whereas tissue culture technology has been practised at IARI for 40 odd years, DNA-based biotechnology is new the world over.

"However, India, just four years into the field, has achievements comparable to many in the developed world and in some cases like rapeseed research has a definite advantage," Dr. Chopra said.

Similarly, India is well ahead of many countries in creation, utilisation and evaluation of clone variation, he said.

But as technology becomes more and more sophisticated, the job of plant breeder becomes complicated. He has to pay attention to higher yields, more productivity, production stability, and in making plants disease and pest-resistant.

"Therefore, it becomes important to give a long-term direction to the process of changes and making the new varieties location specific. So scientists have to be wary of short-term gains," Dr. Chopra said.

Short-term gains can be intensive, but it is long-term sustainability and ecological and economic viability that have to be stressed in the coming years.

"In agriculture, we must realise that though we are in a hurry it takes time in selecting traditional varieties, making a cross and developing a procedure, analysing and finally evaluating success takes upto 12 years before a variety can be released for production," Dr. Chopra said.

Another important aspect that the plant breeder has to keep in mind is that in evolving new varieties no compromises are made with the end product.

As an example, Dr. Chopra said, if a scientist wants to increase the number of a seed-variety, he might reduce the seed weight but he will ensure that the weight per plant is more.

"Compromises are made but always to an advantage. They are never on nutrition value or quality, Dr. Chopra said.

But there are other things that are to be studied and worked out for long-term planning in the field. Firstly, it should be clearly understood that technologies cannnot be developed without developing science, Dr. Chopra said.

"So we at the biotechnology centre want to develop science on which biotechnology is based, that is molecular biology," he said. "We want to mobilise genes for which we have to seggregate the genes. Now, in a plant cell there are

ousands of genes. If one has to take t a gene fo a particular character, one s to know the DNA organisation. nly then, we will be able to have an cess to a particular quality." Then, cation specifications are very impor- nt and one cannot depend on products om developed countries. There are any things for which technologies nnot be bought, they have to be veloped, Dr. Chopra said.

"We are trying to do both — making chnologies that will reach the farm- s in as short a period as possible and veloping a knowledge-base on which e can continue to make contributions the long time to come," he said. The ntre has developed mustard plants ith higher yield than the parental vari- y. After two years of testing on the rm, it is ready for test on plants and e new variety may be available to the rmer in a couple of years.

PECIAL COMPACT MICRO- COPE DEVELOPED

A group of U.S. scientists have eveloped a special compact micro- cope, that uses an X-ray laser, enabling ancer cells and cells related to the ody's immune system to be probed in etail and reveal the very small features n them. This was stated by Dr. Suck- wer who delivered a lecture on X-ray asers in the plenary session devoted to novel concepts' at the recent eighth nternational Conference on Plasma hysics (ICPP).

Dr. S. Suckewer, head of the Plasma hysics Laboratory of Princeton Uni- versity, said that this project had been arried out by the Princeton University lasma physics group in collaboration with biology departments of Rutgers State University, New Jersey, and Uni- versity of Miami, Florida. These are asically contact microscopes, like the conventional optical or the electron microscopes, enabling direct viewing of cellular matter. The advantage here is of higher resolution compared to optical microscopes and much better contrast compared to electron microscopes. The scales which these X-ray microscopes allow to be examined in detail are of the order of fractions of a micrometre. A micrometre is a millionth of a metre and cells are usually of micrometre thickness while viruses have dimensions of 0.5 micrometre. Such resolutions can help understand how viral structures evolve, the growth of cancer cells, the action of cells in the immune system, etc., Dr. Suckewer said.

Resolving Power: The resolving power of a microscope is proportional to the wavelength of radiation the instrument uses to see the object; that is, the instrument can distinguish features which are of a few times the wavelength used. The X-ray microscopes use the so-called soft X-rays, with wavelengths of a few nanometres (a nanometre is a billionth of a metre). The visible radiation that optical microscopes make use of, on the other hand, have wavelengths in the region of 1,000 to 10,000 nm.

Electron beams that electron microscopes employ have wavelengths that depend on the energy of the beam and usually these microscopes do have resolving powder that is similar to the X-ray microscopes but, for biological applications, the resolving power is effectively far less due to the poor contrast in the image. This is because the variation of electron densitites across the material viewed is not significant and beam-material scattering effects dominate and obliterate contrasts. By using X-rays this problem is avoided, Dr. Suckewer said. The Princeton plasma group had developed X-ray lasers nearly five years ago with a wavelength of 18.2 nm and subsequently lasers of shorter wavelengths 15.4 nm and 12.9 nm -- have been developed. The power of lasers used in X-ray contact microscopes is a few milliwatts, these X-ray lasers are applicable to lithography in microelectronic chip making too, according to Dr. Suckewer. X-ray lithography is an important tool in the fabrication of Very Large Scale, Integrated Circuits (VLSIs).

Imaging microscope: A more advanced microscope which Dr. Suckewer's team has recently developed is the so-called imaging microscope, as opposed to the contact microscope, which makes use of X-ray optics and magnifies images just like optical magnification and records the images. The imaging microscope has now been patented by Princeton University. A multi-layer mirror system is used to amplify the X-ray images of the object viewed from tenths of a micrometre to about three micrometres. Once amplified to this level the image becomes amenable to be recorded on imaging cameras that use the so-called Charge Couple Device (CCD) arrays which are about 100 million times more sensitive than photocells.

The X-ray lasers in imaging microscopes have power about a thousand times less and the laser radiation is delivered in short bursts or pulses and images taken in that time. The thrust of ongoing research, according to Dr. Suckewer, is to develop a compact imaging microscope in which the whole equipment is small enough to look cells in vivo or look for organisms in water also. Dr. Suckewer, a scientist of Polish origin and educated in Moscow, is now engaged in developing subpicosecond X-ray lasers of even shorter wavelength of 1 nm using the new generation krypton-fluoride laser systems. These have enormous power and laser radiation is delivered in pulses of extremely short duration of 300 millionth of a billionth of second (femtosecond). In this short duration light travels over distances of only a hundred micrometre -- the thickness of a hair. Such pulses of light create very high electromagnetic fields of 100 giga Volt per cm. A field of this magnitude can pull apart atoms and ionize them into their constituent nuclei and electronics -- a phenomenon called photoionisation.

TUNGSTEN FILM WITH A THICKNESS LESS THAN 1MM

Nisshin Steel Co. Ltd., in Japan has developed a tungsten film having a thickness of less than 1mm, reports ''Techno Japan''. The melting point of tungsten is 3200 degrees to 3300 degrees Centigrade which is higher than molybdenum or ceramics. Therefore it is used as structural material of electronic parts requiring thermal resistance in the form of a sheet, rod or wire.

The company has already commercialised a superfine pipe having a diameter of 2mm or smaller using tungsten. By the development of the film, a new application to thermally resistant heaters to be used at a high temperature will be possible. However, tungsten is resistant to heat but not to oxygen. Therefore it is usable at a temperature of 2500 degrees Centigrade in vacuum but not in oxygen. In order to protect it from oxygen, measures such as coating the surface is required. In the future, the company is going to study mainly non-organic ceramics as a coating material. No heat resistant heater which is operable at a temperature of 2000 degrees Centigrade in an oxygen atmosphere has been developed, and the commercialisation is awaited.

-- P.T.I. Science Service, December 16-31, 1989

HIGH-PERFORMANCE BUTTON LITHIUM BATTERY

Sanyo Electric Co. Ltd. in Japan has developed a high-performance lithium button battery with life longer by 7 to 30 times than that of conventional lithium batteries with a single charge. The conventional lithium battery uses carbon or conductive polymer, while the new battery employs the new synthetic manganese dioxide containing lithium.

The manganese metal is used for the negative pole as in the conventional product. Sanyo Electric expects that the new battery will be in demand for power supplies for memory backup and portable electronic devices such as electronic pocketbooks. The battery has an operating voltage double or more than the nickel cadmium button battery and has less performance degradation during long storage.

-- P.T.I. Science Service, December 16-31, 1989

NEW CAMPTOTHECIN ANALOGUES MAY AID IN COLON CANCER

Synthetic analogues of the drug camptothecin may be effective chemotherapeutic agents against cancer of the colon, according to a recent report by researchers in the United States. The finding may help improve chemotherapy for patients with locally advanced or metastatic colon cancers in whom prognosis is generally poor because of the marginally effective chemotherapy currently in use.

The new drug is a synthetic analogue of camptothecin — a plant alkaloid from Camptotheca acuminata. The original alkaloid is a water soluble sodium salt, and initial trials with it led to partial remission in patients with advanced gastrointestinal cancer. However doctors reported leukopenia (reduction in leucocyte count to levels below the normal count) as a dose-limiting toxic effect. The most prominent non-haemotological complication noticed was haemorrhagic cystisis. The lack of more effective compounds with fewer side effects hampered further development of camptothecin for clinical treatment of colon cancer.

Recently, however, a team of scientists in the United States, led by Dr. Bepinno C. Giovanella, from the Stehlin Foundation for Cancer Research, St. Joseph Hospital, Houston, has reported that new synthetic analogues of camptothecin may be effective against colon cancer. The finding followed renewed interest in the drug after scientists ide tified a nuclear enzyme DNA topois merase 1 as the principal target of cam tothecin. The enzyme plays an impo tant role in DNA replication and oth cellular functions.

Human topoisomerase 1 is a mono meric protein of 100 kilo daltons an acts by relaxing supercoiled DNA report Giovanella and co-workers.

Camptothecin interferes with th DNA breakage-reunion reaction cata lysed by topoisomerase 1 by trapping key covalent enzyme -DNA intermed iate, the report says. Topoisomerase levels are considerably lower in norma cells than in cancerous human colo cells. In general, the levels are 14-1 fold higher in the cancer cells, the sc entists say.

On grafting human colon tumour into immunodeficient mice, the tumour disappeared completely when treate with camptothecin analogues and neg ative side effects from the drug wer minimal. In their experiments, patho ogists froze tissues of colon tumours an normal mucosa in liquid nitrogen withi an hour after surgery and stored ther at -80 degrees Celsius for further ana lysis.

Fifty grams of the finely mince tissue was injected under the skin in th chest region of mice and after a week synthetic analogues of camptotheci were injected. Controls were treate with sodium chloride used as a solver for the compound.

Of the various analogues, 9-AC induced disease-free remissions and th overal drug toxicity was reported to b low. Its high efficacy, however, is no completely understood and further stu dies on camptothecin analogues ar necessary to evaluate their clinical use fulness, the scientist say.

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New Products

RUEFLO BALL VALVES

Trueflo Engineers Pvt. Ltd. manufac-res 3-piece design ball valves suitable r handling corrosive chemicals and quids. Trueflo valves are designed to ve long service life and all the com-onents are individually tested to meet e rigorous quality standards. High ality PTFE components eliminates e need for periodic maintenance. Spe-ally designed mirror finished spheri-l ball ensures perfect matching with TFE seats and give long seat life. low-out-proof stem and live loaded rbon filled PTFE gland packing elim-ates packing problem, gland leakage d reduces operating torque. 3-piece sign facilitates easy installation and -line maintenance at site.Valve seats d seals can be replaced at site with-t the need to remove the valve from e pipe line. All the valves are tested dividually to 104 bar pressure and itable for a maximum cold working essure of 69 bar. Trueflow valves are ailable in CS/SS 316/SS 304/SS 6L/SS 304L/Alloy 20 or any other ecial material of construction as per quirement in size range 15 mm to 50 m with end connection in screwed/-cket weld/Butt Weld ends (extended pples are available as an option). True-valves can also be supplied with tuators to facilitate automation. True-ball valves are ideally suited to emical, pharmaceutical, refinery, fer-izers, petrochemicals, paints, paper d pulp and other process industries.

For further information please con-t: Trueflo Engineers Pvt. Ltd., 16, ngita Apartments, Opp.Akota Stad-n, Baroda 390 020.

SA NITROGEN GAS GENERA-OR

Indcon Projects & Equipment (P) d., offers in technical collaboration th and under licence from Bergbau rschung Gmbh West Germany, PSA nitrogen plants in capacities ranging from 5 NM^3/hr to 1500 NM^3/hr and suitable for generating gas of purity ranging from 98 per cent to 2 ppm (ultrapure nitrogen).

PSA nitrogen plants are based on the well proven technology of separation of nitrogen from compressed air by absorption of oxygen from compressed air over carbon molecular sieves (CMS).

The advantage of PSA technology lies in the fact that is neither cryogenic nor does it use scarce petroleum fuels. Low cost of nitrogen generation of less than Rs. 2 per NM3 makes PSA technology economical as against cylinder nitrogen even for small capacities.

Other advantages are fully automatic start up, skid mounted packaged unit, virtually negligible maintenance with the only utilities required being compressed air and cooling water.

For details contact: Indcon Projects & Equipment Pvt. LTd., 344, New Nagpada, Hirji Govindji Estate, Opp. Richardson & Cruddas Ltd., Bombay 400 008.

OXYGEN CONVERTER

Oxygen converter introduced by Jenway Ltd., UK., can convert any conventional pH or conductivity meter with an mV range to give a direct readout of dissolved oxygen in either p.p.m. of %. It may be used with any high impedence digital volt-meter, chart recorder or data logger. Jenway also manufactures dissolved oxygen meters for laboratory and field use.

Model 9010 embodies the state-of-the art electronics. It converts the output from the highly stable DO2 probe into a millivolt output and covers the range of 0 to 19.9 ppm and 0 to 200%. It is connected to the instrument via a one-metre lead which is fitted with a BNC connector. Alternative connectors are available.

The unit is supplied complete with a dissolved oxygen electrode which is an exclusive product of Jenway's electro-sensor division and is one of the most stable DO2 probes in existence, incorporating dual temperature compensators for membrane permeability and oxygen solubility and having pre-tensioned screw on membranes to ensure instant replacement and repeatability of readings.

The instrument is supplied in a protective case complete with two membranes, a bottle of electrolyte, a zero solution and three BOD rings for varying sizes of bottles.

For further details write to Aman Marketing Services (P) Ltd., 101, Mittal Chambers, 228, Nariman Point, Bombay 400 021.

LIQUID LEVEL CONTROLLER

Innosys automatic liquid level controller controls liquid levels in a simple, inexpensive yet effective manner. It automatically regulates the operation of motor pumps according to the fluid level in overhead tanks, thus preventing wastage and avoiding errors through human labour.

It consumes negligible current, requires no maintenance, is shock-proof and very economically priced. It is a must for multi-storey buildings, hotels, industries and generally wherever overhead tanks are required.

Soon, a lower-cum-overhead tank model will also be introduced in the market, which will safeguard against dry running of pumpsets where underground liquid supply is scarce. It is also suitable for pumping stations as well as farms. For further details contact Innosys Electronics & Systems Pvt. Ltd.,

174/A-2, Shah and Nahar Industrial Estate, Dhanraj Mills Compound, Lower Parel (W), Bombay 400 013.

NEW CARBON BLACK/PLASTIC CONCENTRATE

The series of Degussa's carbon black/plastic concentrates has been extended by the introduction of RKK UNI 40. This new product is suitable for use as a black pigment in thermoplastics and differs from Colcolor UNI 50, which has been on sale for this purpose for a number of years now, in that it consists of a larger particle-size and therefore is a cheaper pigment black and a modified binding agent. As the pigment accounts for a high proportion of the productr, RKK UNI 40 exhibits good spreading properties. The polymer binding agent does not contain any filler, the carbon black is dispersed to an ideal degree. This new product can be handled cleanly, while batching presents no problems.

"DEGULOG" SENSOR SYSTEM

The degulog sensor system, from the Measurement and Control Products Business Area (Federal Republic of Germany) represents a new generation of field transducers. The degulog system combines analog transmitter technology with the versatility of a microcomputer, thereby widening the applications of Degussa's range of analog head and field transducers for temperature measurement, which enjoys a high reputation in measuring and control technology.

The degulog field transmitters are equipped with microcomputers which process the digitized signals. The degulog system is of particular benefit wherever and "intelligent" evaluation of results is desired. Such applications include plausibility tests, linearization of input signals, trend calculations, etc.

Degussa AG has acquired VDO Messund Regeltechnik GmbH from VI Adolf Schindling AG of Frankfu Degussa will combine this compa with its own Measurement and Cont Products Business Area to form the n company called SENSYCON Gmb for the production of industrial sens and process control instruments and s tems. The new company will be bas in Hanover, West Germany.

The fusion of the two areas of act ity to form SENSYCON GmbH is first step toward a major expansion business activities in the rapidly gro ing sensors market. Worldwide sales this market are already estimated at billion deutsche marks. The compa will concentrate its activities mainly the field of industrial measurement a control technology. With a staff of so 1,100 in the two locations of Hanov and Hanau, and additional domestic a foreign subsidiaries, SENSYCON w achieve annual sales in excess of 20 m lion deutsche marks.

Environmental pollution problems of sugar and distillery units in Maharashtra

Dr. D.G. HAPSE, S.V. ARABATTI and P.L. KULKARNI
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About the Authors

Dr. D.G. Hapse is specialist in plant physiology, agronomy, plant breeding and cyto-genetics and Director, Deccan Sugar Institute, Pune. He holds post-graduate degrees — M.Sc. (Agriculture) from Pune Univeristy and Ph.D. from Penn. State University/IARI under USAID program. Earlier, he has held faculty positions at College of Agriculture, Pune and Dhule and DSI. He was also with Central Sugarcane Research Station, Padegaon as Sugarcane specialist to improve cane yield and sugar recovery. He is an adviser to several sugar factories and a member of several state and central institutions/committees/panels for sugar industry. He has a number of publications in national and international journals and is actively associated with several professional and social welfare programs and has travelled widely.

S.V. Arabatti has over three decades of wide experience in major distilleries in Maharashtra. His expertise covers many aspects of alcohol production — alternate raw materials, batch/continuous fermentation, absolute alcohol, IMFL, spentwash incineration and potash/energy recovery besides by-products. His rich experience is now available to many distilleries subsequent to his joining Deccan Sugar Institute, Pune in 1985, as alcohol technologist.

P.L. Kulkarni is a Chemical Engineer with B.Tech., M.Tech., degrees from Mysore University. He is engaged in sugar technology and By-products and chemical engineering applications like ion exchange, evaporation, combustion at Deccan Sugar Institute, Pune since 1975.

Abstract

There are over 100 sugar factories and 40 distilleries in Maharashtra State, producing about 3.0 million tonnes of sugar and 160 million litres of alcohol annually. Quantity of effluent produced from sugar factory amounts to 0.5 to 0.6 m^3 per quintal sugar produced, whereas 15 to 20 litres of spentwash is produced per litre of alcohol. The present process adopted in sugar factories for the treatment of effluent is discussed along with the steps suggested for reduction in quantity of effluent by proper house-keeping. Distilleries based on conventional batch-fermentation technique are still adopting anaerobic lagooning method whereas distilleries adopting continuous fermentation give concentrated spentwash (20-25% solids) advantageous for the process of concentration and incineration and also for composting. This paper reviews the current status and performance of various technologies adopted.

Sugar industry

The sugar industry in India has been playing an important role in the economic development of the country. There are over 350 sugar mills in India producing sugar to the extent of 90 million tonnes of which Maharashtra's contribution is nearly 30%. The various steps in manufacture of sugar from sugarcane are crushing and extraction of juice, purification, concentration, crystallisation, centrifugal separation of crystal sugar, drying and bagging.

Thus it may be seen that the process of sugar manufacture does not in itself have any operation necessitating regular discharge of liquid effluents. The discharge often seen in practice comprises of washings and surplus generated in the vapour condensing systems. The average quantity of effluent discharged from sugar factory amounts to 500-700 m^3 per day for 1250 TCD sugar factory with the following typical analysis:

pH: 4.5 to 6.0
BOD: 1000 to 1500 mg/l
COD: 1800 to 2500 mg/l
SS: 100 to 150 mg/l
Oil and grease: 50 to 80 mg/l

The basic principles for the treatment of sugar factory effluent are based on those already well standardised for domestic sewage, such as coarse and fine screening to remove suspended solids, sedimentation for removing settleable con-

stituents, separation of oil and grease and anaerobic digestion, followed by aerobic treatment or dilution and use as irrigation water.

All the sugar factories in Maharashtra are following one of the following methods for the treatment of effluent: Lagoons, conventional treatment or extended aeration. Based on the study carried out by Vasantdada Sugar Institute and other research institutes and reputed consulting agencies, the following common observations are made regarding the operation/performance of effluent treatment plants for sugar factories.

1. Some of the factories are over-utilising the crushing capacity which increases the load on effluent treatment plant above design capacity.
2. Frequent failure of power supply from electricity board also affects the performance.
3. Sludge bulking has been reported in some cases.
4. Lack of qualified and trained personnel for operation and maintenance of plant and carrying out regular routine analysis. However in some cases where sugar industry is linked with ancillary industries like distillery, paper and chemical plants, qualified/skilled persons are appointed for the operation and maintenance of effluent treatment plants.
5. Lack of proper housekeeping and cleanliness inside the sugar factory which leads to increase in pollution load.
6. By adopting proper recycling and reuse of waste water, the quantity of raw water used has been drastically reduced which leads to reduction in pollution load in respect of quality and quantity.

In general, it has been observed that the main pollutants in the effluents from sugar factory are oil-greases and sugar bearing products from floor and press washing etc. Through good housekeeping and separation of the streams from mill house, boiler house, press mud section and boiling house e and through ordinary preliminary treatments like oil a grease trapping, separation of solids by sedimentation, maki up pH through addition of lime, separating and recycling high sugar bearing streams, it is possible to maintain the po lution load within tolerance limits prescribed.

Distillery industry

There are 40 distilleries in Maharashtra having a tot licensed capacity of 220 million litres/annum. The averag alcohol production in Maharashtra distilleries is about 16 million litres per annum. The principal raw material for di tilleries is molasses which is a by-product of sugar factorie The annual production of molasses in the state of Maharash tra is 8.0 lakh tonnes which on an average is 3.5% of tot cane crushed. The average yield of alcohol per tonne o molasses ranges from 220 to 235 litres/tonne. Average spent wash generated is in the proportion of 15 litres per litre o alcohol produced in case of conventional distilleries. Recentl seven distilleries have adopted the latest technology of con tinuous fermentation and concentration of spentwash. Th quantity of spentwash generated in these distilleries varie from 5-10 litres per litre of alcohol produced.

The spentwash which is a waste product of the distiller is capable of polluting underground water, streams, and rive water. It is highly acidic and carries a BOD load o 35000-45000 ppm. The total solid contents in spentwash i found to be as given in Table 1 for batch and continuous pro cess.

The capacity of distilleries range from 15,000-75,000 LPD with spentwash discharge of 225 to 1125 m^3/day. If th spentwash is not treated properly and is allowed to flow t fields or rivers very serious nature of pollution can take place Although spentwash itself is not highly toxic it is very much favourable for the propagation of toxic bacteria, endanger-

Table 1

Sr. No.	Process	% Solids	Special Features
1.	Conventional	8-10	Alcohol %: 6-7%. Recovery of steam from spentwash Use of Exhaust steam for R. column bottoms
2.	Cascade System	16-22	a. High alcohol conc. of 9-10% b. Use of Reboiler and flash evaporation system c. Use of exhaust steam d. Yeast recycling
3.	Biostil	22-25	a. Spentwash recirculated for dilution of molasses b. Dilution water used is only 30% of conventional system c. Use of Reboiler d. Use of exhaust steam for rectifying column bottom

the health of cattle and human beings, who have to depend this polluted water. Due to high concentration of BOD spentwash aquatic life is highly affected.

ogas generation

Considering the potential danger due to pollution of water the industrial waste, Government has enacted stringent vs and stipulated the following rigid specification for the ality of treated spentwash.

	BOD (mg/l)
Irrigation on land	100
Discharge in river	30

It is very difficult for the distillery to treat spent wash to eet the requirement of above specification because of sence of proper technology. In Maharashtra most of the t lleries are still adopting lagoon system for spentwash.

The general method for treatment of spentwash was that anaerobic digestion in open lagoons. It consists of 3.5 M ep lagoon with 60 days detention capacity. The culture for aerobic digestion was developed by dilution of cow dung d maintenance of pH at 7.0 by addition of lime. Once the ocess of anaerobic digestion is well established the pH of goons is automatically maintained at 7.0. The BOD is graded to 80 to 85% of the total. The disadvantages of goons are percolation of spentwash and pollution of ground ter and odour nuisance. The effluents of lagoon still have h BOD (6000-8000 mg/l). Permission for this kind of atment is now practically discontinued. In the process of ooning, valuable methane gas is lost to atmosphere.

Spentwash of distillery is looked upon as a source of energy cause of its high calorific value. Two principal methods available for energy generation from spent wash.

1. Anaerobic digestion and recovery of methane gas.
2. Concentration and incineration of spentwash.

Different technologies of anaerobic digestion of spentsh for methane gas generation are now available. BOD ntent of spentwash is reduced by 35 to 90%. The digester luent has a BOD of 5000 mg/l. It can be used for comsting. One distillery in Ahmednagar District has installed ull fledged plant for methane gas generation based on lzer technology. The results reported are very attractive regards recovery of energy from spentwash. There is subntial saving of fuel for steam generation.

Another distillery (45,000 LPD) which has finalised Paque SB technology to treat its spentwash for methane gas is o in Ahmednagar District.

The typical results expected by the installation of methane gas plant are as under.

Distillery capacity 45,000 LPD

Quantity of effluent	700 m^3/day
BOD reduction	85-80%
COD reduction	65-70%
Final BOD value	5000 mg/lit
Final COD value	24000 mg/lit
Biogas production	0.5 m^3/Kg COD degraded
Total biogas production	22444 m^3/day
Cal. value	5600 K.cal/m^3
Equivalent quantity of coal saved	31.42 MT/day
Fuel saving	93%

The cost of methane gas plant is approximately Rs. 170 lakhs. The complete project shall cost about Rs. 200 lakhs. The pay-back period works out to only three years. The methane gas project requires 15-20 months for execution and regular commissioning.

In spite of great advantages which can be achieved by installing methane gas plant, very few distilleries are coming forward to select this process. The digester effluent is still left with high BOD of 5000 mg/l. The distilleries are doubtful as to the possibility of further degradation of the effluent to 100 BOD by adopting lagooning and aeration in the context of unfavourable economics and high power requirement. One distillery in Gujarat having methane gas plant using thermophilic bacteria claims that it has achieved a BOD level of 500 mg/l by lagooning the digester effluent at BOD 5000 mg/l and further aeration by surface aerators. The general opinion of technologists is that a BOD upto 2000 mg/l can be achieved by treating the digester effluent.

Energy recovery from non-conventional source is a great attraction of the process followed by substantial reduction in BOD. Distilleries are repeatedly requesting the Government to modify the BOD limits for treated effluent from 100 to 2000 mg/l so that energy generation system by anaerobic digestion to produce methane gas could be acceptable to the industry. Different technologies of methane gas production like Sulzer, Bacardi, Paques, Degremont etc. are being tried in different distilleries in the country. The process based on indigenous technology is also reported to be working at K.C.P. distillery in Andhra Pradesh.

Concentration and incineration

Another method of recovery of energy from spentwash is based on concentration upto 60% solids and combustion in a special kind of furnace to generate steam and electricity. K.T.I. Italy offered such technology to one of the distilleries in Dhulia District. Considerable time was required for com-

pleting formalities with subsequent escalation in price. The project is highly capital intensive and payback period is very long.

M/s. Praj Counseltech have developed a process of Sprannhilator for concentration of spentwash from 22 to 60% by scrubbing with hot flue gases in a Venturi Scrubber. The concentrated spentwash is fired in a special furnace to achieve complete combustion. It requires support fuel of 6 tonnes of bagasse and 105 kW electricity. The method has been recognised by environmental department and pollution control board. One plant located in Kolhapur District for 25 KLPD distillery and another plant in Pune District for 45 KLPD distillery, are reported to offer zero pollution. For distilleries which cannot have any other means of waste disposal system Sprannhilator has provided excellent relief for the time being. It is quite likely that joint venture to concentrate and incinerate the spentwash for generation of system and electricity may come out very shortly. If the cost of plant is economical it will offer a better solution. M/s. Thermax Ltd. have put up a pilot plant for spent wash concentration and incineration in public sector distillery in Ahmednagar district. The operation of plant had a number of constraints. Trials are being conducted after necessary modifications.

It is claimed that the process for 45,000 LPD distillery will generate 13 T/hr of steam which is sufficient for distillery and spentwash concentration plant, and surplus power to the extent of 500 kW. The economics of this process can become favourable if the ash produced after complete combustion fetches a better market value. Experiments in several agricultural universities are being conducted to find its usefulness as a potash rich fertiliser. The distilleries in Maharashtra are very actively considering selection of concentration and incineration method. A private firm has proposed to put up three big size plants at a suitable locality to consume all the spentwash of Maharashtra Distilleries. The firm shall provide reboilers for the distilleries and spentwash storage tanks and shall arrange to transport the spentwash to their site for incineration. The firm shall have alcohol based chemical plant for which all steam and electricity produced will be used or may feed electricity to the grid. The distillery in turn has to pay 25 paise per litre of alcohol produced. Apparently the proposal is attractive because distilleries can get rid of po lution problem. It will however much depend on the perform ance of technology and success of the contract.

Composting

Four new distilleries have selected method of composting The method of composting requires press mud from the suga factory. The seedling for availability of bacteria is done b using cow dung or composted material. Press mud is stacke near the compost pits for natural drying from 50-60% mois ture to 10% moisture. 100 tonnes of dried press mud is place in layer in pits and 100 cu. metre of spentwash is loaded The mixed material shall be upto 2 feet. Again 100 tonne of press mud is added and, 100 cu. metres of spentwash i sprayed on its top. The whole mass is turned up and dow by excavator type tractor every alternate day upto eight day and then stacked for curing for a period of 25 days. The anal ysis of spentwash compost percentage on a dry basis is give as follows, for a distillery in Kolhapur district.

	N	P	K	Ash	Volatile
Pit 1	1.80	0.69	1.80	35.8	64.2
Pit 2	1.64	0.59	1.90	30.0	52.7

Samples of compost from a distillery in Pune District gav the following analysis (%).

	Compost age days	N	P	K
Sample No. 1	10	2.0	0.8-1.1	2
Sample No. 2	20	2.6	0.6-1.3	1.5-2.0
Sample No. 3	30	1.92	0.5-1.2	1.7-2.0

One distillery in Kolhapur district has selected a bioeart system of Fabcon, Phillipines. In this process organic wast decomposition is properly controlled. It yields nutrient rich biologically active soil builder. Filter mud is used with spent wash. C:N ratio is balanced by proper blending of raw mater ials. Moisture, temperature and aeration are monitored an controlled using the Fabcon wind row aerotilling machin which is required to be imported. Total cost of the projec is about Rs. 75 lakhs for 30 KLPD distillery, adopting con tinuous fermentation technique. The quantity of bioeart likely to be available from a distillery of 30 KLPD capacity is given Table 2.

Table 2

	Quantity Tonnes	Moisture content	Dry material	Final product with 10% moisture
Daily spentwash	150.0	120.0	30.0	33.0
Daily press mud	70.0	52.0	22.0	24.75
Total	225.0	172.5	52.5	57.75

Thus, daily 58 tonnes of bioearth compost will be produced. Bioearth is applied one to four tonnes per hectare of land annually. It is of particular value for cane, corn, rice, vegetable crops etc.

Use of compost material results in waste recycling besides reducing the use of chemical fertiliser, better plant nutrition, reduced land depletion and enhanced overall economic viability. The performance of bioearth would be available for demonstration in the next season. The current status of different treatment plants for handling distillery spentwash in Maharashtra is summarised in Table 3.

Table 3
Status of distillery spent treatment plants in Maharashtra

	Technology	No.	Remarks
1.	Methane gas	2	One - commissioned One - initial
2.	Composting	3	Commissioned
3.	Sprannhilator	2	One - commissioned One - ready for commissioning
4.	Bioearth	1	Almost ready
5.	Concentration and incineration -steam and power	1	Trials in progress

Paper presented at CESE - IIT, Bombay, State-of-the-Art symposium on Treatment Options — Sugar, Distillery, Paper and Allied Industries, December 7-8, 1989.

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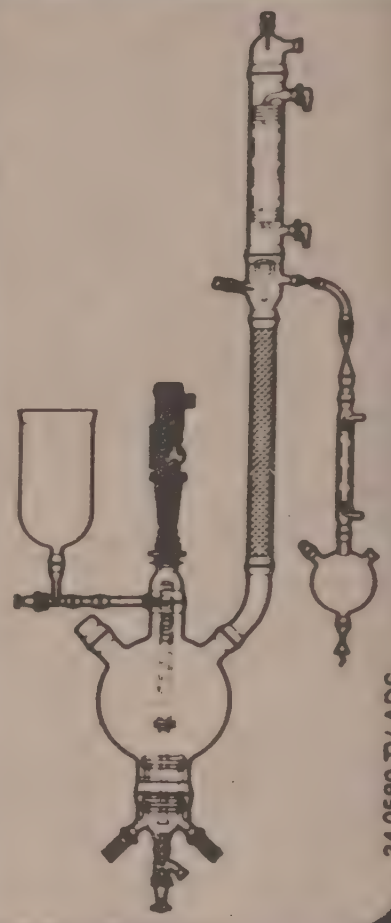

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Indian chemical industries at cross roads

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There is no doubt that there have been significant improvement and progress in the performance of Indian Chemical industries during the last three decades, in various aspects including the product quality, capacity utilisation, plant layout and process control measures. It can be clearly seen that the imports of different chemicals are coming down every year. Several of the products, which were imported in the last decade, are now banned for imports, as adequate indigenous manufacturing capacities have been built up. While these are healthy indicators of progress, it has also to be kept in mind that Indian chemical industries have not been able to make any sort of breakthrough in the export front.

Apart from the inadequate performance in the export front, Indian chemical industries are unable to compete with the international industries even within India itself and the protective measures by the Government of India in the form of high import duty and restrictive measures of import have become absolutely important for the survival of Indian chemical industries. The sale price of most of the industrial chemicals produced in India are substantially higher than the prevailing international price levels. This is so, even in the case of such chemical products, which do not have to import raw materials with high import duty from abroad and whose raw materials are totally available in India itself.

Under such circumstances, one cannot but fear that Indian chemical industries are structuring their operations in such a way that they would be operating only in the Indian market for long time to come. The Government of India's efforts to break this impasse by encouraging the setting up of 100% export oriented projects by special concessions and the advance import licence schemes have also not resulted in any significant export growth by Indian chemical industries. This only makes it evident that the export performance of Indian chemical industries cannot be improved by mere fiscal and tax concessions alone. A greater initiative has to come from Indian chemical industries, bringing around improvement in technology, economy of scale of operations, raw material/-utility consumption norms, product quality, product packing techniques and sales policies, with the international market in view.

The biggest problem faced appears to be in the size of the chemical industries itself, which, in turn, effectively reduces the scope of Indian units to operate in the world market. The operating size of most of the Indian units are so small, that they cannot even afford to maintain an adequate sales force to promote the sale of their products in the competitive world market. When the operative levels are small, there is no possibility of the generation of adequate income to spend money in sales promotion, research and development efforts to update product quality and optimise the cost of production. Such smaller units cannot also afford to invest adequate funds to introduce qualitative instrumentation and computerised process controls, which have become an absolute necessity to stay afloat in the competitive international chemical industry scenario.

During the last few years, there has been import of technology in a big way by Indian chemical industries. Even such import of technology has not boosted the exports of products, due to higher capital costs contributed by heavy project delays and disproportionate level of pre-operative expenses. The various government agencies, including the licensing bodies, environmental control agencies, state owned financial institutions take not less than two years to provide all the licences and clearances.

It takes two years from the date of conceiving the project to the effective date of commencement of project implementation and another minimum of two years for the implementation of even medium sized chemical projects. With the prevailing higher interest burden and depreciation provisions in India compared to advanced countries, the fixed expenses for unit product in India is much higher than the similar products produced in advanced countries. This makes Indian chemical products uncompetitive in the world market.

While the diagnosis of the problems facing the Indian chemical industries appears to be an easy task, the prescription to overcome the problems is by no means an easy one. Obviously, the problems are interwoven with different factors and some of them are mutually conflicting. While the Government of India can certainly help and is helping by constantly reviewing it's export-import policies and concessions, it is very clear that the ball is only in the court of chemical industries. They have to overcome their obsession with Indian market and the requirement of protective measures.

Every one of the Indian chemical industries must make it part of their corporate policy to export atleast a small percentage of their production, even if the price realisations were to be low, as a patriotic duty to the motherland. The profit generated by many of chemical industries are quite adequate, that they can afford to have a dual pricing system, for Indian and export markets, that would not affect their economy in any significant way.

As of now, the investors in chemical industries in India are finding it extremely difficult to find suitable projects with adequate gap in supply in India, for investment. For example, such an important product like acrylic esters have a total annual production capacity of hardly 13,000 tonnes in the country and demand of only 7,000 tonnes per annum. Investors say that there is no further scope for creation of capacity for acrylates production in India in the next few years.

The Indian production of titanium dioxide is less than 0.5% of the total world production of around 3 million tonnes per annum. There is a view that there is scope for only one more titanium dioxide industry in the country of annual capacity 20,000 tonnes before 2000 AD. Many more such examples can be readily cited. This is a very negative approach, optin for the easiest path of operating only in India.

If Indian chemical industries were to fail to exhibit dy amism and look towards the world market, it is quite po sible that the future growth of chemical industries in Ind may take a downward trend in the coming years.

The purchasing capacity of the average Indian should n become the only basis for growth of chemical industries i India. If this were to be so, there would be no scope for pr duction of several sophisticated chemicals at economic leve in the near future in India. The Indian chemical industry i certainly, at the cross roads.

Advances in control of secondary recovery*

Introduction

The first oil was produced from the UK sector of the North Sea in 1975. Since that time the pace of development has been very rapid and there are now approximately 35 oil fields in production in the UK sector. The development costs for these large offshore fields have been very high and total capital costs of individual fields in excess of US $2 billion were by no means unusual. This large "front end loading" led to the necessity of covering every performance eventuality and therefore practically without exception the necessary equipment for water and/or gas injection has been included in the original facilities design. In the same manner allowance has been made for the necessary number of injection wells.

The need to recover the very heavy development costs as soon as possible has led to very high extraction rates. In the UK sector it has become normal to have a peak production rate of some 10-15 per cent per annum of ultimate recovery. This compares with depletion rates in the Middle East of less than 1 per cent per annum. As a result of this high depletion rate a great deal of experience of secondary recovery methods has been acquired in a short time period.

This paper reviews the production performance of several types of fields in the UK sector. As the reservoir engineer frequently has to resort to analogy it is to be hoped that this experience will prove useful in the examination of the application of secondary and tertiary recovery methods to Indian reservoirs.

Recent attempts at using EOR (surfactant and polymer) applications have been thwarted by the continued weakness of oil prices (especially in terms of sterling). As a result recent experience with polymers and surfactants has been restricted to the clean up of water injection wells and the use of permeability blocking polymers in wells following severe early water breakthrough.

Field types to be examined

Because of the high cost of development in the North Sea, it is inevitable that, for a reservoir to be commercial, the average permeability of the producing horizon must be high. Initial well rates in excess of 5-10,000 barrels a day are generally required if a project is to be economic.

Although average permeabilities are therefore typically of the order of several hundred millidarcies the permeability contrast between the better and poorer parts of the reservoir can be striking and it is by no means unusual to find subzones with a permeability in excess of 10 darcies on the high side and less than 10 millidarcies on the low side (a ratio of 100 to 1).

Oil is currently produced from Palaeocene, Jurassic, Triassic, Permian and Devonian reservoirs with the Jurassic reservoir being the most prolific. With the exception of the Permian, all producing reservoirs in the UK sector of the North Sea are clastic reservoirs although significant production from Cretaceous carbonate reservoirs occurs in the Norwegian and Danish sectors.

In general UK North Sea crudes typically have API gravities between 35 and 45 degrees although commercial production has been undertaken where the API gravity is as low as 25 degrees. Gas oil ratios show wide variation, even locally, and range from less than 100 cubic feet per barrel to about 2,000 cubic feet per barrel. The corresponding viscosities are low generally being less than 2 centipoise and always less than 10 centipoise. Mobility ratios therefore range from favourable to marginally unfavourable with the result that recoveries under water injection were expected to be high and that prolonged periods of high rate water free production were anticipated. In practice although the recovery factors will broadly reach those predicted, water breakthrough has occurred much earlier in the field life and the high recoveries will only be obtained having circulated large volumes of water.

In most areas of the UK sector the reservoirs are significantly faulted with the result that associated acquifers range in size from very small to moderate. The perceived necessity for water injection has therefore become a reality. Only in one case, which will be discussed later, has the original equipment installed on the platform turned out to be redundant. However, even in this case the initial decision to include the equipment was correct because no guarantee could be given of the size of the associated aquifer before production commenced.

Most North Sea fields of Jurassic age and older are over pressured (effective gradients measured from surface of 0.6 to 0.8 psi per foot being common). Furthermore the bubble point pressure is frequently much lower than the original reservoir pressure. Natural depletion recovery factors would, therefore, be low in the absence of water drive and commonly would not be greater than 10 to 15 per cent. Given that the average recovery factor predicted for North Sea fields in general is in excess of 40 per cent the advantages of water injection are clearly evident.

In order to fully exploit the water injection potential of

* Paper presented by Robertson Erc Limited at the Offshore Oil & Gas and Chemical Seminar, held in January 1989.

these North Sea Fields, significant use has been made of the Repeat Formation Tester (RFT) and production logs (PLT). These tools have proved invaluable in assisting the process of refined reservoir description. The integrated geophysical, geological and petroleum engineering teams are therefore able to act in concert in creating a field description which fits all the available data.

Field examples

Palaeocene Reservoir - Forties

The Forties field is the biggest in the UK sector of the North Sea and is currently estimated to have an ultimate recovery of 2500 MMstb.

The field was discovered by BP in October 1970 and production began in September 1975. The field is produced from 5 fixed steel platforms and a total of more than 100 wells have been drilled of which 80 are producing wells and 20 are water injection wells. The plateau rate was about 500 Mstb/day and is currently about 250 Mstb/day. Water injection rate is currently approximately 450 Mbbl/day.

The field is a broad anticlinal structure with four-way dip closure and is about 90 square kilometres in area with a vertical relief of about 600 feet. The reservoir comprises sandstone of Palaeocene age. The reservoir is normally pressured with an initial pressure of 3200 psig and a bubble point pressure of about 1200 psig.

Natural water influx has occurred providing strong bottom and edge water drive. In order to maintain an adequate rate, water injection commenced early in the field life. The advance of water is strongly gravity controlled and in many ways this reservoir may be said to be behaving in text book fashion. Previous estimates of recovery factor are about 50 per cent, although it is now expected that recoveries as high as 60 per cent will be achieved with the widespread use of artificial lift at high water cuts.

Cretaceous Reservoirs - Claymore

The Claymore field was discovered by Occidental in May 1974 and commenced production in November 1977. Although there are four oil bearing horizons the main reservoirs are of Jurassic and Cretaceous age. The Jurassic contains approximately 800 MMstb while the Cretaceous contains about 350 MMstb. This discussion will consider the Cretaceous reservoir only.

The Cretaceous reservoir comprises sands which are deposited in a system of fan channels. The sands which can be very calcareous are best developed close to the main structure with thinning and decreasing reservoir quality away from the structure. Porosities range betwen 20 and 25 per cent and permeability is between 200 and 700 millidarcies.

The reservoir is being produced under water injection. The wells initially produced are at rates of up to 15,000 stb/day. From the advent of water breakthrough however oil rates fall dramatically over a period of less than one year with water cuts rising equally quickly. Wells consequently have a relatively limited life after water breakthrough which is not unexpected in view of the favourable mobility ratio of the fluid system. The flank wells in the Cretaceous have already exhibited this performance and even one of the central wells is now producing water. It is therefore to be expected that later in the field life the reservoir rate will decline dramatically as the last of the wells go to water. An overall recovery factor between 40 and 45 per cent is expected.

Production logging has been crucial in determining the overall perforation and recompletion policy in this stratified reservoir and without adequate attention to detailed reservoir management the recovery factors would have been much lower.

Jurassic Reservoirs

N.W. Hutton

The N.W. Hutton field is one of several Jurassic fields situated east of the Shetland Isles in the northern part of the UK sector of the North Sea. The field lies in a water depth of 470 feet. The field was discovered in March 1975 and following appraisal drilling a seabed template was installed and pre-drilling commenced in late 1979. A single piled steel platform was installed in late 1981 and production commenced in April 1983.

The reservoir comprises two main fault blocks and contains approximately 1000 MMstb of STOIIP. Top reservoir is at approximately 11,200 feet with the majority of the reservoir being below 11,500 feet.

The production history of fields in this area which commenced production earlier than N.W. Hutton has been very variable. Huge permeability contrasts exist within each of the fields with lateral continuous streaks of very high permeability being common. This has led to very high initial well productivity (rates in excess of 30 Mstb/day being commonplace) but also very fast breakthrough of injected water. Most fields in the area were expected to have recovery factors of between 40 and 50 per cent after circulation of several pore volumes of injected water.

It should be noted that prior to N.W. Hutton all the fields that had been developed were at less than 10,000 feet. In N.W. Hutton severe in-situ degradation of permeability has occurred due to the presence of "fine threads" of illite across the pore throats. This renders a significant portion of the reservoir non-net under in-situ conditions.

Unfortunately this was not a recognised pre-production as e process of core cleaning destroys the lattice network of e illite and permeabilities as measured in the laboratory are en reasonably good. The net effect was to reduce the xpected peak rate of 100,000 barrels per day to less than),000 barrels per day as the well production rates showed recipitous declines (decline rates of 20 to 30 per cent per onth being normal).

Attempts at water injection led to severely channelled flow rough the remaining high permeability zones and it is only ith careful reservoir management that the operator has been ble partially to compensate for the very adverse reservoir nditions. The expected ultimate recovery from N.W. Hutton 150 million barrels being some 15 per cent of the total oil place or some 30 per cent of the effective oil in place (i.e. at oil which is present in permeability above 1 millidarcy reservoir conditions).

In this field the RFT tool has been invaluable. Reservoir ressure contrasts in excess of 5,000 psi are not uncommon nd this combined with the high degree of faulting has led very complicated water movements. The combination of eophysical and RFT analyses has allowed a comprehensive fill programme to be conducted. Without this programme coveries would have been significantly lower and the field ould have been unable to achieve an economic return.

Fulmar

In complete contrast to the N.W. Hutton field the Fulmar eld, which was discovered in November 1975 and com-enced production in February 1982, has significantly xceeded initial production forecasts. Reservoir quality is xcellent with permeabilities averaging several hundred mill-rcies and with a total reservoir relief of up to 900 feet the servoir performance is strongly gravity controlled.

Although 36 well slots were provided only 30 wells have en drilled and the reservoir continues to produce at a capac-y rate of 135,000 barrels per day. Because the production ells are high on structure and the injection wells are sit-ated in the aquifer, water breakthrough to date has been very mited and overall recovery factors are expected to be high - probably exceeding 50 per cent. Unlike N.W. Hutton, the servoir requires little day to day detailed production man-gement as the gravitational effect means that sweep effi-encies are very high.

riassic Reservoirs

Triassic sands in producing fields in the UK sector of the rth Sea are generally of poor quality (relative to other hor-ons) and significant production has only been obtained from e Triassic Lewis reservoirs of the Beryl field. The zones e unusually heavily compartmentalised and as a result only limited water injection has been attempted. Depletion recoveries are low — normally 5 to 25 per cent.

Permian Reservoirs

Two examples exist of Permian production in the UKCS, the Argyll and Auk fields. The Argyll field produces from two formations, the Zechstein carbonate formation and the Rotliegendes sandstones while the Auk field only produces from Zechstein. Unusually for the UK sector of the North Sea both these fields have been produced under strong natural water drive. Given the highly faulted nature of both fields is somewhat surprising but is attributed to the faults being "leaky".

The Argyll field uses a floating production system which does not have water injection facilities. The Auk oil platform was conventionally equipped having water injection facilities but these were never used and have recently been removed. Because of the faults and the vugular nature of the Zechstein carbonate, prediction of water movement has been very difficult in both fields and a significant programme of infill drilling has occurred in Argyll resulting in large increases over those initially accepted. By North Sea standards both fields are small and ultimate recovery is expected to be in the 70 million barrel range for Argyll and 85 million barrel range for Auk.

Permeability contrasts are not marked within the carbonate zone and it is the broken up nature of the field which causes irregular sweep. This has resulted in a long period during which both have experienced high water cut production. The Rotliegendes sandstone reservoir in Argyll is of much more variable quality and some parts do not respond particularly well to water drive.

Devonian Reservoirs

The Buchan field is an east-west oriented horst in the Outer Moray Firth Basin, about 95 miles to the north-east of Aberdeen. The average water depth is 400 ft. The structure is located mainly in UK Block 21/la, but it also extends into Block 20/5a. The field came on stream in May 1981, and by 1st June, 1987 had produced 54.8 million barrels of oil.

The Devonian reservoir comprises a sandstone which is extensively faulted and fractured, and is bounded by major faults. The major horst area of the field covers about eight square kilometres. The oil reservoir is found at depths from about 8,500 feet and extends down to an oil water contact at about 10,400 feet below sea level. The Buchan field reservoir consists of a tight, low porosity, sandstone/siltstone matrix, through which an extensive fracture system occurs.

The reservoir in the Buchan Field was originally significant over-pressured. Current field performance suggests

some form of pressure support from the underlying aquifer. This suggests a more efficient recovery than previously considered likely. The well productivity ranges from 1,000 barrels of oil per day for a flank well outside the main horst structure to 10,000 barrels of oil per day on the horst.

A gas life artificial lift system has been installed since 1985 to assist liquid recovery from all wells. The production facilities on the floating platform are adequate for the gross fluid volumes expected to be handled. At present the field is performing better than earlier estimates suggested, and subject to good oilfield practice this improved performance is expected to continue. Current programmes are designed to determine whether further development drilling is justified to maintain production.

Enhanced oil recovery

Several years ago it would have been expected that EOR techniques would have found wide applications in the North Sea. Indeed a pilot flood of low concentration surfactant had been produced and agreed for the Forties field and several other studies were well under way. The precipitous decline in the oil price in 1986 led to a significant curtailment of plans. To date in the North Sea the major experience of surfactant has been associated with clean-up of the near well bore area of water injection wells. The purpose of this clean-up was to remove, as much as possible, any residual oil thereby significantly increasing the water injectivity.

Polymers have also been used in the North Sea mainly by back injection at production wells. The objective of this injection has been partially to block high permeability streaks. These treatments have met with variable success but have on occasion reduced water cuts from 90 per cent plus back to less than 30 per cent with a concomitant increase in the oil rate. Unfortunately this improvement has tended to last for a period of no more than six months and the economics associated with polymer injection is at best unproved.

It is not clear at this stage whether the oil produced over the six month period is simply accelerated oil or is indeed incremental. Should the latter be true, polymer injection of this type is worth carrying out. If the oil is simply accelerated then the economics are distinctly unfavourable. Surfactant studies continue to be performed in the Norwegian sector and simulation results in the Statfjord field have been sufficiently encouraging that it is intended to carry out a pilot flood in the early 1990s. It should be stressed that a significant recovery in the price of oil would lead to an up-surge of interest in EOR techniques.

Conclusions

Water flooding performance in the North Sea has generally been very good. Comparison with predictions prior to commencing significant reservoir development has shown that the recovery factors of 40 per cent plus which were predicted can be achieved. However, in order to achieve these recoveries it has been shown that much greater volumes of water have had to be circulated through the reservoirs as the advance of the water has been much less regular than was originally predicted. This irregularity is due to a combination of the very variable permeability and also in no small measure to the rate of off take. This rate of off take does not allow gravitational influences to be great leading to a performance which is completely dominated by viscous forces and the permeability distribution.

The North Sea can therefore be characterised by several relatively unique features:

1. An unusual rate of depletion.
2. An extreme cost environment.
3. A particularly high added value per well.
4. As a consequence of 1, 2, and 3 the quantity and quality of technical data which are gathered greatly exceeds that available in most other parts of the world.

It therefore follows that the degree to which technical evaluations are carried out greatly exceeds the norm. This presents a significant opportunity for integrated project teams to maximise their technical input and leads to a high level of job satisfaction. British companies are therefore strongly placed to provide advanced levels of technology transfer.

Chemical news from abroad

HOECHST PLANS ACETIC ACID/ ANHYDRIDE FACILITY

Hoechst is planning to build a 400,000 ton/year acetic acid/anhydride production facility. No details of the possible location of the DM200m ($107m) unit have been revealed. At the same time the company announced the sale of Hoechst Celanese's PVC films division.

Speaking in Frankfurt, Hoechst chairman Mr. Wolfgang Hilger said potential sites for the new plant are currently being studied from the aspect of feedstock availability, with a decision to be announced shortly. Start-up is scheduled for early 1994.

The new unit will not, however, involve a significant increase in existing acetic acid/anhydride capacity. The planned facility will replace two older plants at Frankfurt and Knapscak, with total capacities for 350,000 ton/year. While the older plants utilize ethylene feedstock, the new unit will operate on methanol or carbon monoxide according to technology newly developed by Hoechst.

Construction of the new acetic acid/anhydride plant, which will secure starting materials for Hoechst's production of manmade fibres, polymer dispersions, pharmaceuticals, agrochemicals and flavours and fragrances, is not designed to increase output but cut costs. Hilger explained the use of methanol or carbon monoxide as the feedstock will provide relief from "strong price swings for ethylene".

At the same time, Hilger hinted that proximity to a carbon monoxide source would play an important role in the choice of location, adding that methanol feedstocks would "provide no transportation problems". As start up is scheduled for early 1994, the possibilities for fast approval of the plant could also be an important factor, he said. Analysts believe this would favour the Knapsack site in North Rhine-Westphalia, as authorities in that state have a reputation for approving industrial plants more quickly than officials in Hesse.

Meanwhile, Hoechst Celanese has sold its PVC films manufacturing activities to the US films group American Mirrex. The business has been completely absorbed by Mirrex which has its activities, like Hoechst Celanese, based in Delaware.

A spokesman for Hoechst said the US business was not competitive owing to the shortage of in-house access to feedstocks. Retaining the business would have meant considerable investment in improving production facilities, funds which the company prefers to spend on the much larger polyester films business.

ICI TO PULL OUT OF COMPOSITES?

ICI may pull out of hi-tech area of advanced composites, suggested chairman Denys Henderson in a recent television interview. Although it is an area with exciting growth prospects, there is a lot of competition and "it is not making much money at the moment," he said.

ICI has been active in this sector for almost five years and will remain there in the short term. However, the company has to decide whether it is a business where it can made good profits in ten years' time, said Henderson. "We certainly have the science, we certainly have the chemistry, we certainly have the knowledge of the marketplace, but whether in the end of the day we will make money out of it, we are not too sure".

Prospects are bright, however, for the hybrid seeds area, where ICI has been active for 7-8 years, according to Henderson. The company has been building in this sector by research investment and acquisition, "and there are some pretty exciting signs that by the end of the next decade that will really be making a very significant contribution to ICI," he added.

Henderson said he was not concerned about a possible break-up or takeover of ICI, because the strong interrelationship between all the technologies would make unbundling very difficult.

ABB AGREES BID FOR COMBUSTION

Asea Brown Boveri (ABB) the European electrical engineering group, has announced an agreed bid for $1.6bn for US power and engineering group Combustion Engineering.

Combustion which concentrates its petrochemicals operation under its subsidiary Lummus Crest, said chemical activities contributed around $1bn/year to sales. Although ABB would not comment on its plans for Combustion's petrochemicals operations, sources say it has expressed a desire to develop and invest into this area.

A spokesman for Lummus said the venture was a move that Combustion had been seeking for some time and is confident that it will gain a strong base to grow within Europe. "There are invitably many oppotunities for construction and expansion within Eastern Europe and we believe we are in a position to take advantage of these," he added.

WEST GERMAN FIRMS SEEK EAST LINKS

West German chemical major BASF says it is keen to take advantage of expansion opportunities within East Germany and would hope to establish the close cooperation it had prior to the second world war. Market observers say other companies which are also in a

position to take advantage of recent developments within East Germany include Hoechst, which operates its own engineering arm Uhde. Other companies actively pursuing projects in the area include Schering and Veba.

Veba, which already procures chemicals in East Germany, says it has other projects in the pipeline.

Meanwhile, Schering is currently seeking technological exchanges in East Germany.

Sources expect a trend towards revamping petrochemical projects within East Germany. "It is also very likely that as living standards improve, there will be a trend towards speciality chemicals in East Germany," said one London analyst.

The West German government has already shown its commitment towards investment in East Germany through a DM300m ($161m) five-year environmental project.

Market observers say the West German government is expected to continue to explore any cooperation opportunities within East Germany.

However, there are obstacles, said a spokesman from BASF, such as difficulties in obtaining private land and the unstable East German currency.

Meanwhile, looking at the other side of the coin, analysts are expecting West German chemical companies to benefit from the influx of East Germans into West Germany as the constuction and automobile industries boom.

GL TO STREAMLINE

Great Lakes Chemical Corp. is considering the sale of either part or the full 40 per cent of its stake in Huntsman Chemical Corp.

Discussions about the sale are an ongoing tissue, said a Great Lakes spokesman, who explained that the group wanted to concentrate on its specialities business rather than polystyrene and commodities.

Sources say head of the group Jon Huntsman wants the stake back. Huntsman claims that he can take more risks, such an increasing debt, if he is not answerable to a shareholder.

Great Lakes is the one piece of the Huntsman holding that is outside family control.

Meanwhile, Aristech Chemical Corp. has delayed its decision on the proposed acquisition of Aristech by Huntsman for $1bn. Aristech's chairman and ceo Thomas Marshall said that a decision would be taken shortly.

Chemical markets abroad

PARAXYLENE PRICES DIP AS EXPORT OPTIONS RECEDE

Paraxylene spot prices have slumped to $595-600/ton fob NWE, as European merchant sellers feel export opportunities have receded, at least until the year end. For the last month European numbers have remained stable at $635-640/ton fob NWE, with speculation on future export potential supporting prices.

The market appears to have concluded that Sunkyong's 160,000 ton/year South Korean PTA plant will not be commissioned in the near future. This plant had been expected up at the beginning of quarter three.

Formosa Chemicals and Fibres Co. (FCFC), has given no indication of when it expects its 200,000 ton/year Taiwanese PTA plant up. This unit was originally expected to be commissioned in June this year. Between them the two units would have consumed approximately 150,000-200,000 ton of paraxylene in 1989. Many players had banked on these plants coming onstream and so had committed paraxylene to the Far East. Observers say a relatively large overhang of product exists in the region.

An indication of the lengthening market in the Far East is shown by the fact that the last three Indian tenders were sourced out of South Korea. India is believed to have secured all the paraxylene it will need in 1989, putting a further dampener on the merchant market. Debottlenecking of existing units and the re-structuring of its buying policy, has left India less dependent on the spot market.

Approximately 5,000 tons of material has been sold at the lower spot price of $595-600/ton fob Rotterdam. Traders are thought to have sold quantities of product to a European producer, which has yet to complete its maintenance turn around.

In the past months, export opportunities out of the US have diminished. The country's PET industry has gone through a phase of being relatively uncompetitive to the Far East. Prices have now fallen and the industry is in a better position to exploit the export opportunities. The US East coast currently has no spot requirements and overall the paraxylene market has gone from tight to long.

Another factor leading to lower paraxylene prices has been the decline in downstream polyester staple fibre production in the Far East. Taiwan had committed a great deal of capacity on China re-entering the staple polyester fibre market market as a major buyer. Because of limitations in foreign currency, Chinese purchases have been much lower than expected. Taiwanese staple fibre producers have now cut back production by some 30 per cent, to compensate for the lack of exports. Fortunately strong polyester filament demand has partially compensated for the reduction in exports to China.

The world paraxylene market appears to be relatively long. Some players feel the present surplus will be a short-term phenomena. Worldwide expansions in PTA and DMT capacities, due on stream in 1990 and 1991 are cited as factors in mopping up any paraxylene surpluses. Meanwhile, predicted strong growth in PET and polyester fibres could also bolster paraxylene usage.

CHINESE IMPORTS PLUMMET

China's imports of hdPE/ldPE look set to drop to 500,000 ton/year in 1989, from the heights of 900,000 ton/year in 1988, according to Houston consultant Pace. Polypropylene imports are also predicted to slump from 467,000 ton/year to 300,000 ton/year, in the same period. Underpinning these developments is June's political upheaval plus the lack of foreign currency available to importers. Throughout 1989 producers have noted that lack of foreign exchange has impeded China's imports. With the economy overheating in 1988, the government took a series of measures to reign in inflation and slow consumer growth.

According to Pace, over 50 per cent of ldPE used in China goes into agriculture, with 30 per cent used in packing. The remainder is used in a welter of miscellaneous end-uses.

China's production levels look set to race ahead into the mid-1990s. In 1988 ethylene output reached 1.2m ton/year, and is predicted to rise to 2.5m ton/year by 1995.

Propylene production will grow from 680,000 ton/year to 1.4m ton/year, in the same period., Benzene levels will almost double from 520,000 ton/year in 1988, to 900,000 ton/year in 1995.

China's petrochemical industry is predicted to show a growth rate of 10-11 per cent/year into the mid-1990s. Paraxylene output, which stood at approximately 300,000 ton/year in 1988, should rise to 500,000 ton/year by 1990, reaching 900,000 ton/year by 1995.

Continued hesitation by foreign investors could hinder the growth of China's petrochemical industry, the consultant warns. Lack of foreign currency could provide another major problem. One other area of concern is the infrastructure, which is in need of development.

US PHOSPHATE ROCK PRODUCTION RISES

US production of marketable phosphate rock rose to 49.7m ton during crop year 1989 (1 July, 1988 to 30 June, 1989), an increase of 15 per cent over 1988 production, says the Bureau of Mines, US Department of the Interior.

The amount of marketable rock soldor used increased by approximately 8.9 per cent from 45.8m ton in 1988 to 49.9m ton in 1989.

Apparent consumption during crop year 1989 was 42.3m ton, about 10.6 per cent more than the 1988 level of 38.3m ton.

According to statistics collected by the Bureau, phosphate rock exports for crop year 1989 amounted to 8.5m ton, an increase of about seven per cent on the 8m ton exported in crop year 1988.

The Bureau of Mines says the value of exports has risen from $24.08/ton to $27.38/ton fob mine over the same time.

However, the US Bureau of the Census claims that phosphate rock exports for crop year 1989 represent 9m ton although it does not supply figures for the value of such exports.

OCCIDENTAL STARTS UP POTASSIUM SULPHITE

Occidental Chemical Corp. has entered the liquid potassium sulphite market with the start-up of a production facility at its Niagra Falls, New York, speciality chemicals plant.

The unit, built at a cost of over $1m, came on stream recently. Oxychem claims the agreement is tangible evidence of its continuing commitment to supplying the Puerto Rican markets.

To Fairbank Corporation of Hato Hey, Puerto Rico, which serves as Oxychem's sales representative, has been authorized to accept purchase agreements for delivery from the new terminal.

ITC MARINE DOCK

Intercontinental Terminals Company (ITC) is to operate a new marine dock at Exxon Chemical Company's Anchorage marine terminal on the Mississippi River at Port Allen, Louisiana.

The dock is currently under construction and is scheduled for completion in the first quarter of 1990.

It is designed for use by both barges and world-scale tankers.

ITC and its affiliates provide a complete range of serices and facilities for the liquid and dry-bulk storage requirements of the petroleum, chemical and petrochemical industries.

The company operates its own 200-acre terminal on the Houston Ship Channel at Deer Park, Texas and operates and maintains major proprietary terminals in Baton Rouge, Louisiana and Tampa, Florida.

Plastic markets abroad

MARKET STABILIZES AS PRICE EROSIONS RECEDE

Europe's polymer market has regained a degree of stability, with little evidence of further price erosions. It appears that firm producer discipline on reducing capacity rates plus convertors' efforts to re-stock earlier-depleted inventories have buoyed prices. However, producers attempting to go beyond steadying numbers and look for across the board price hikes have not been completely successful.

Industry continues to gain in confidence, and now feels that a platform has been established for some price development. Both traders and convertors state that the current recovery is not as widespread as producers would have one believe. General purpose high volume grades are still said to be available at relatively low numbers, while continued competition amongst producers is keeping prices down.

Signs are emerging that export potential is picking up and providing further opportunities for producers and traders. Inventories shifting from suppliers to convertors give some indication of the changing market. Producers note that the last two months have seen a significant reduction in stocks. It has been estimated that inventories have dropped by some 15 per cent in certain sectors. Over the previous eight weeks, total sales have been 10 per cent higher than the previous year, say suppliers.

A number of scheduled plant outages have added to tightening supplies. Although the majority of shutdowns are underway or even completed, they are still influencing the market. Some producers are believed to be undergoing difficulties in recommissioning units, adding to the perception of tightening supplies.

Apart from a willingness to reduce capacities, producers appear to be increasingly willing to consider closing older units. The latest closure is Appryl's 10 year old Lavera 100,000 ton/year polypropylene plant. This trend is more prevalent in polymers which have experienced new capacities in the past year.

European polypropylene prices have steadied, with no further price loss noted. Producers' attempts to bring prices at the lower end of the range into line appear to have been successful. However, attempts at an overall price hike have not really materialized with posted figures being pegged back. PCD's West German plant has yet to be commissioned although this is expected shortly. Uncertainty also surrounds the new Beaulieu unit, which was due on stream earlier in the quarter.

Raffia grade numbers are stable at DM1.40-1.45/kg. Although small deals may have been concluded below this level, these are not thought to be representative to the market. Injection moulding grade numbers have shown little movement. Despite increased sales which have depleted inventories, prices range from DM1.55-1.70/kg.

Copolymer is one area where vigorous competition for market share is hitting numbers. Activity has seen prices dip to DM1.70-2.00/kg. Lower numbers are believed to be available, although these remain unconfirmed.

Low density polyethylene (ldPE) continues its recovery. Scheduled maintenance turnarounds have diminished supplies. Buyers are fairly activeshifting inventories from producers to convertors. Several suppliers are pushing for a uniform European price, leading to some price rises at the bottom end of the range. Attempts to hike ldPE prices to DM1.70/kg do not appear to have been too successful. Prices range from DM1.60-1.65/kg.

As oversupply continues to afflict the lldPE market, the gap between lldPE and ldPE is still great. Demand has been stable rather than strong. Blender ability to substitute lldPE and ldPE could decrease any price differential. LldPE numbers are quoted in the range of DM1.52-1.56/kg, with lower numbers being talked.

Hdpe has been psychologically affected by the explosion and outage atr the 675,000 ton/year Phillips Pasadena hdPE unit. With the US market seen to be long, the shutdown does not appear to have affected global prices.

European hdPE remains balanced and has drifted to long on certain grades. With cheaper export product available in the market, the general purpose high volume grades face downward pressure. Injection moulding ranges from DM1.60-2.00/kg, but exported product is quoted below the market range. Blow moulding continues stable at DM1.80-2.05/kg, with speciality grades representing the higher end of the range. Film grade product is stable at DM1.75-2.05/kg.

Polystyrene prices remain much the same as last month, in the range DM2.25-2.35/kg for general purpose and DM2.35-2.45/kg for high impact grades. Producers had hopes to raise prices to around the DM2.40 level for GP and DM2.50 for HIPS, although these have not been fully realised. Demand is currently strong, especially in the seasonal electronics and toys sectors, and availability is also good.

Producers report that October production and sales were very much in balance but that a slight level of destocking took place.

Imports of materials from Brazil and Mexico, which looked to be increasing in the summer, are not now having an impact because of increased home demand and the biting of EC duty tariffs from mid-October.

News about new projects

CONTENDERS FIGHT FOR STAKEIN BRAZIL'S ITAGUAI COMPLEX

Following the creation of PetroRio, plans have firmed up for Brazil's Itaguai petrochemicals complex. The basis of the project is a $1.1bn. cracker, on the outskirts of Rio de Janeiro city, with ethylene capacity of 545 000 ton/year, scheduled for completion in 1996.

PetroRio's chairman, Oswaldo Peckolt, says the raw materials capacity will include 220,000 ton/year propylene, 69,000 ton/year butadiene, 270,000 ton/year benzene, 175,000 ton/year paraxylenes, 10,000 ton/year orthoxylenes, 43,000 ton/year pyrolysis residues, 50,000 ton/year MTBE, 74,000 ton/year solvents, 150,000 ton/year LPG and 120,000 ton/year gasoline.

Peckolt says he has never known such intense competition for projects in the 20-year history of Brazilian petrochemical complexes. Proposals for nine downstream projects have been made by 36 companies encompassing nationals, multinationals and companies which have a state-owned partner, as is characteristic of Brazilian industry.

Competition for alpha olefins and PTA is a little easier, comprising individual bidders, an association of Deten/Shell and a consortium of Petroquisa, Mitsubishi, Pronor, Rhodia and Celbras. Meanwhile, some eight companies are fighting for lldPE, ldPE and hdPE, with a combined 200,000 ton/year capacity. Two international companies, Union Carbide and Solvay, are competing for PE.

The Brazilian industrial development secretariat has introduced progressive criteria to select proposals for downstream projects. Tenders will have to include a bid for shares in PetroRio. At the final stages of selection, those bidding for a large number of shares will have priority.

This new mechanism, according to Peckolt, will secure the feasibility of the Itaguai complex. He quotes Leonardo da Vinci: "All projects are doomed to remain mere projects without the needed resources for their implementation."

The major source of financing will still come from Petroquisa, its subsidiaries and associated companies, which hold shares amounting to 65 per cent of PetroRio's capital. BNDES, the Brazilian National Development Bank, will also hold preferred shares.

Capital for the project is to be raised to some $600m, with loans coming from local sources and foreign capital. The Brazilian petrochemicals industry has a total turnover of $11bn. and assets of some $14bn. says Peckolt, stressing the sector's cash flow ability to carry out the proposed petrochemicals development.

The estimated investments for PetroRio do not include the costs for centrals to thermal energy generation, production of industrial waters and for solid and liquid effluents treatment.

Peckolt has estimated the maximum cost for waters production at $40m, while for the other utilities, investments will depend on downstream projects.

It is likely, Peckolt says, that a cooperative system will be adopted to integrate the capital of PetroRio and the three centrals for energy, water and effluent treatment. The latter, especially, depends on the technology to be adopted by downstream projects.

STATOIL AIMS TO RISE IN POLYOLEFINS LEAGUE

As part of its recently announced campaign to be Western Europe's fifth or sixth polyolefins producer, Statoil has revealed it is planning to build a secon line at its North Sea Petrochemical joint venture with Himont at Antwerp The second unit will be identical to th first, producing 180,000 ton/year PP.

Himont's latest version of its Spher ipol PP process will be used, and Ai Products' Catofin propane dehydroge nation technology for propylene. Th complex will be fully integrated, usin propane from the North Sea.

Statoil says this will be the first Euro pean plant to use propane dehydroge nation. Other plants which will use th technology include an NPC Thai uni and a Venezuelan plant, both under con struction.

Himont and Statoil have equal share in the project and will market the pro duct under their own labels., Statoil ha sales outlets in West Germany, Franc and the UK, as well as in Denmark Sweden and Finland. It also has agent in Italy and the Benelux. The company aims to expand sales within the Euro pean Community.

Meanwhile, in polyethylene, th company has announced plans t increase its production outside Scandi navia to 300,000 ton/year. It is currentl in talks with other major producers looking at the possibilities of joint ven tures, buying into existing projects an increasing processing capacity. A com pany spokesman confirmed: "Whateve we do, it will be with partners."

Statoil's current PE capacity (includ ing projects underway) totals 250,00 ton/year. The Bamble hdPE expansio is due for completion in early 1991. P output totals 120,000 ton annually, wit an additional 10,000 ton of compound ing capacity.

The second PP line at Antwerp, an an additional 300,000 ton of PE woul bring Statoil's total polyolefins capac ity to around 860,000 ton/year.

News from abroad

INVESTIGATION INTO PHILLIPS DISASTER

The October 23, explosion at Phillips Petroleum's (Bartlesville, OK) Houston Chemical Complex at Pasadena, Tx killed 23 people and virtually destroyed a polyethylene (PE) reactor at the site. The disaster was 'foreseeable' according to Robert E. Wages, vice president of the Oil, Chemical and Atomic Worker's International Union (Denver). The three possible causes of the accident could be faulty maintenance procedures, the use of less-experienced sub-contract maintenance crews, and an inherently flawed reactor design.

The Number 6 PE reactor, where the explosion occured, vented its contents into the atmosphere through an open reactor valve.

Resin is removed through six settling legs at the base of the reactor that can be isolated by closing a block valve. Settling legs are periodically unclogged with the reactor still in operation. At the time of the accident, reactor No. 6 had a settling leg removed for servicing. A lock-out device should have been placed on the valve and air-line valves be closed. The system should also be identified as being locked out with "DO NOT USE" tags. But according to Wages, Phillips maintenance lock-out policy is inconsistent with standards established by Occupational Safety & Health Administration (OSHA) because maintenance workers do not have to place locks with personalized IDs on the valves, and there are no accompanying information tags on the valves or in the control room.

Investigation showed that the Demco valve on the reactor was in the open position and the lock-out device on the leg was not in place. Air control lines were still attached and at lease one air block valve was still open. A preliminary investigation showed the settling leg was only partly assembled. The large valve separating the leg from the reactor loop was in the open position, which could allow hydrocarbons in the reactor to be released into the atmosphere.

A subcontracting crew from Fish Engineering and Construction (Houston), was at work on the reactor when the massive release occured. Fish Engineering personnel were employed as no labour agreement was required and the firm charged 35% less than what a Phillips employee would have to be paid. It had been determined that Fish did not have its maintenance crew lock out or properly tag the Demco valve.

In August, a lock-out accident occured at the same plant, leaving one union member dead and four people injured. Fish Engineering subcontractors opened piping to an off-gas scrubber tank without isolating the line. This vented flammable solvents into an adjoining work area. OSHA proposed a $1,400 fine for this incident.

It was contended that the design of the PE reactor was flawed. It did not include fail-safe systems that could automatically shut a valve that was improperly venting to the atmosphere. It had no high pressure dump and flame system to allow the leaking reactor an alternative flow pattern besides uncontrolled release to the atmosphere.

One of the biggest lessons from the accident was "how much the regular workers are at risk from contractor work practices."

The OSHA is preparing new rules for the storage, handling, and processing of highly hazardous chemicals. The rules will require employers to set up management systems to address the hazards of chemical processes, including preventive maintenance, quality control, hazard analysis and employee training. The chemical industry is considered to be far safer than most other manufacturing industries.

But when an accident does occur, it is likely to be of catastrophic proportions.

KEMIRA TO BUILD H_2O_2 PLANT IN JAPAN

Kemira, Finland, has set up a joint-venture with Ube Industries, Japan to build a hydrogen peroxide (H_2O_2) plant in Japan. The new company, Kemira-Ube will use Kemira's proprietary process in a 20,000 m.t./year plant at Ube's chemical complex in Ube, slated for late 1991 start-up. Half the output will feed Ube's downstream production requirements for making such products as nylon and catechol. The rent is to be targetted at the Japanese market, currently in over-supply.

Kemira plans other ventures with Ube, primarily building on Kemira's pulp and paper industry applications expertise.

The joint-venture gives Kemira an international presence in H_2O_2 just a year after start-up of a 20,000 m.t/year. Unit at Oulu, Finland, using its anthraquinone process. Kemira has another project at Rotterdam, the Netherlands, scheduled to start in 1991. Doubling up of capacity at Oulu is under study. Kemira's Chemical business includes the former Americal Cyanamid titanium dioxide business, fertilizer units in the Netherlands, Belgium and the U.K. and water-treatment chemicals.

UBE TO TAX BOILER EMISSIONS

A proposed Clean Air Bill under consideration could levy a sizeable emissions fee on industrial boilers operated by the chemical industry and other manufacturing companies in the U.S.

The Dingell plan would impose a 10-year tax of $55/ton on industrial

boiler emissions that emit more than 100 tonnes/year of sulfur dioxide (SO_2). A $45/ton tax would be levied on utilities. The U.S. industrial sector emits about 5 million tonnes/year of SO_2 while utilities give off about 15 million tonnes/year. Fees would apply to cogenerators and independent power producers and government facilities. Boilers operated by hospitals, colleges, universities or residential apartments would be exempt.

The proposal is a part of a plan to spread the costs of acid rain controls expected to be borne primarily by Midwestern utilities. A bill proposed by President Bush on the other hand requires utilities to foot the bill for equipment purchased or actions taken to reduce emissions. The White House opposes any cost-sharing plan based on a fee or tax to industry.

SHELL PLANS FOR MORE EO/EG

Shell Chemical (Houston) is about to announce a plan to build a new 450-million lb. per year. EO/EG facility at its existing production site at Geismar, LA, thus increasing its existing capacity considerably. The company's 830 million lb. per year EO capacity at Geismar is being extended to 870 million lb. per year. If approved, Shell would became the second largest producer of EO, after Union Carbide (Danbury, CT).

The EO unit will be slightly larger than necessary to support an EG unit plus production of other derivatives, and ensure merchant availability. Supply of EO to merchant market has been decreasing since several majors decided to up EO derivatives, production.

Texaco Chemical & Union Carbide major suppliers to the merchant EO market, already announced withdrawal from merchant business sales. They plan to increase production of other EO derivatives, for example fiber-grade ethylene glycol for export and ethanolamines. The merchant EO market has been extremely tight. EO prices have remained stable this year, compared to tabs of many other commodity chemicals. While there has been some slight weakening in prices contract tabs have dipped only recently from 60 cents/lb to about 55 cents/lb and are expected to stay firm much of next year. Union Carbide plans to increase total EO/EG capacity by 1.2 billion lb per year.

Tabs have been drifting in a weak market, producers have been cutting contract tabs to 40 cent/lb. and spot prices are 10 cents/lb. below that level. MEG utilization rates are about 80% in 1989, and should stay around that level until 1991-92. But if all scheduled expansion for EO/EG come on stream, utilization rates could drop down to 67% by 1995.

PP IN JAPAN: HEADING FOR A GLUT?

Mitsubishi Kasei and Mitsubishi Yuka will build two new PP plants in a joint venture, especially conceived to reduce the risk of overcapacity and a disorderly market. The partners will build a 50,000 m.t/year plant at Mitsubishi Kasei's Mizushima complex for mid 1991 start-up. Mitsubishi Yoku formerly Mitsubishi Petrochemical will build an 80,000 tpa unit at its Kashima plant due on stream in mid 1992 and close a 30,000 mt/year unit at the site. The two companies will work in collaboration with Daia Polymer. Total investment in the plants is expected to be $83-93 million. The two Mitsubishi companies had planned to expand PP capacities separately, but Japan's Ministry of International Trade and Industry (MITI) opposed that route, fearing overheating of the PP market.

Quite a lot of PP capacity is under construction in Japan by joint ventures and individual producers. Ukishima Polypropylene grouping Nippon Petrochemical, Mitsui Petrochemical, and Mitsui Toatsu, started up a new 80,000 m.t/year PP plant in Nippon Petrochemical's Kawasaki complex, in November. Three other PP units also started this year--Tonen Sekiya Kagaku's 60,000 m.t/year, unit in Kanagawa prefecture Idemitsu Petrochemicals 40,000 m.t/year plant at Chiba, and Tokuyama Soda's 45,000 m.t/year PP unit at the Tokuyama complex.

In spring 1990, Chiba Polypro-owned by Tokuyama, Sumitomo Chemical and Ube will start up a 60,000 m.t/year PP unit at Sumitomo's Chiba complex. Yokkaichi Polypro owned by Chisso and Toso has a 40,000 m.t/year, plant at Toso's Yokkaichi complex, due to start production in mid-1990. Asahi Chemical has a 40,000 m.t/year PP plant due on stream at the end of 1990 at its Mizushima complex.

Polyolefin sales in Japan are made through four marketing companies -- a grouping of several producers set up under MITI prompting during the industry's period of heavy losses. They are Daia, Mitsui Niseki Polymer, Union Polymer and Ace Polymer. Demand growth for automobile of electronic use has made Japan's PP demand outstrip that for other resins. In 1988, Japan's PP production volume was 1.56 million m.t. up 11% from that of 1987. In 1989, output is expected to reached 1.7 million m.t. But planned expansions of almost 500,000 m.t/year may result in overcapacity in the early 1990s.

DU PONT, STATOIL TO BUILD METHANOL PLANT IN NORWAY

Conoco (Houston) the oil and gas subsidiary of Du Pont (Wilmington, De), will negotiate with the Norwegian state oil group, Statoil (Stravenger) for a world-scale methanol and methyl tert. butyl ether (MTBE) project.The facility will be based on natural gas from the Heidrun field off Norway's west coast that will start up in '96, and in which Conoco is a major partners. It will consume 750 mcm/yr. of gas to produce 840,000 tpa of methanol in Norway. The MTBE plant, capacity ranging from 400,000-500,000 tpa would be built within the European Community area.

News from Japan

MITI TO PROMOTE INTERNATIONAL TIE-UPS FOR FINE-CERAMICS BUSINESS

With the aim of promoting international co-operation in fine-ceramics operations, the Ministry of International Trade and Industry (MITI) is scheduled to establish next spring International Co-operative Council for Fine-Ceramics Business (tentative name): the planned council will comprise of representatives from private enterprises, Japan Fine Ceramics Association (JFCA), Japan Fine Ceramics Centre (JFCC), The Ceramic Society of Japan and public/university laboratories.

The council will promote information/personnel exchange among all interested parties both at home and overseas and hold international meetings and seminars. Private companies, universities and laboratories have hitherto independently sent trainees to third parties and accepted them from outside. The council will coordinate technical training in fine-ceramics business.

MITI is examining the feasibility of the council joining the United States, W. Germany and Sweden in cooperatively developing gas turbines for automotive use. The council will be managed by JFCC. MITI envisages reorganising the council into International New Material Center (tentative name) some time in the future.

Fine ceramics are being aggressively developed in Japan, the States and the EC. Japan has worked out many national projects covering fine-ceramics operations and is a step ahead of the U.S. and EC countries with regard to the promising industrial field concerned.

Japan's market size for fine ceramics exceeded ¥1,000 billion in 1988. Her fine-ceramics production accounts for 70% of combined world production. With due consideration given to trade friction related to high tech business, MITI has studied for some time what forms international co-operation in fine-ceramics operations should take.

AUSTRALIAN Al MAKERS START EFFORTS TO SECURE STABILISED CAUSTIC SODA SUPPLY

While there is a world-wide supply shortage for caustic soda, Australian aluminium manufacturers have started positive efforts to secure caustic soda imports. Australia — one of the world's major aluminium producer countries —has drawn up a plan to expand aluminium production in order to meet the increasing demand for aluminium. Accordingly, it has begun to take long-term measures to secure a supply of caustic soda, which is indispensable for aluminium production. Inquiries have come to Japan, too, about the possibility of concluding long-term contracts.

The world's total aluminium output is estimated at 30 million t/y, of which one-third, or 10 million tons, is turned out in Australia. The country is thus a major world aluminium production base. The Australian aluminium manufacturers are Alcoa, Queensland Aluminium, Nabalco, and Worsley. These four companies have drawn up plans to expand production in order to meet the world-wide increase in demand for aluminium. Efforts for the expansion of production by such steps as removal of bottlenecks have already reached a limit. The respective manufacturers are planning to expand production by 30-50%.

On the other hand, Australia relies almost totally on imports for her supply of caustic soda, which is indispensable for alumina production. It has one caustic soda manufacturing company (production capacity: 100,000 t/y). However, the products of this company are used almost totally for consumer items, such as secondary alkali products. So, Australia is importing the caustic soda necessary for alumina production from North America, Europe, Saudi Arabia, and Japan etc. Imports this year are expected to amount to Rs. 900,000-950,000 tons, or about 15% more than the amount imported last year.

The basic unit of caustic soda in aluminium production is 0.9. Australia needs about one million tons of caustic soda every year. It is indispensable for the four aluminium manufacturing companies planning to expand production to secure a stabilised caustic soda supply. Thus these companies have started brisk efforts to secure supplies of caustic soda on overseas markets.

At present Australia is importing 100,000 tons of caustic soda from Japan every year, with the remainder shared almost equally by North America, Europe and Saudi Arabia. The Japanese manufacturers concerned have received inquiries about the conclusion of long-term contracts from such Australian companies as Alcoa and Worsley. However, it is considered impossible for the Japanese side to meet such requests because supply is rather short in Japan as well.

CATALYTIC SYSTEM FOR PP LICENSED TO AMOCO

Mitsui Petrochemical Industries, Ltd. has licensed Amoco Chemical Co. (U.S.) a patent on a magnesium-applied catalytic process for polypropylene (PP) production.

The system developed in 1976 by the Japanese company in co-operation with Himont USA, Inc. (U.S.) is jointly owned by these two companies. It incorporates high-activity, high-stereoregularity catalysts and is regarded as one of the most efficient production technologies for block polymer (polypropylene). It has already been licensed to 34 companies across the world.

Since the catalysts employed for the system have high-level activity, the system itself has a high yield ratio for polypropylene and requires no deliming process. In addition, since the catalysts also have high stereoregularity, the sysem produces only a small amount of atactic polymer and therefore, calls for no process for removing such polymer.

Due to these advantages, the system is capable of producing polypropylene having excellent physical properties and high-level rigidity and transparency.

BASF SETS UP JOINT FIRM FOR ENGINEERING PLASTICS

BASF Japan Ltd. — a Japanese subsidiary of BASF AG (W. Germany) —and Mitsubishi Petrochemical Co. have jointly established BASF Engineering Plastics Co., on an 80:20 ownership basis to further promote engineering-plastics business. James Atushi Yoshida, managing director of BASF Japan, has taken office as president.

BASF's nylon 6 and 66 as well as polyacetal were previously marketed in Japan through Mitsubishi Yuka Badische Co., equally owned by Mitsubishi Petrochemical and BASF Japan. The new company handles all these products plus heat-resistant resins including polysulphone.

The company is scheduled to build next year Plastics Applicational Technical Center and a compounding plant on BASF Japan's Yokkaichi site. It intends to provide its customers with excellent service in marketing, technical support and a reliable source of supply, thereby tripling sales in Japan of BASF products within a few years.

The steadily increasing demand from the automotive and electronics industries has brought double-digit annual growth rates to the world's engineering-plastics market. Based on the business experience gained within Mitsubishi Yuka Badishe up to now, it was decided that further business expansion would best be achieved by establishing an integrated business line covering manufacturing, marketing, R & D and technical service in a new company.

MITSUBISHI KASEI, MITSUBISHI PETROCHEM AGREE ON JOINT PP PRODUCTION

Mitsubishi Kasei Corp. and Mitsubishi Petrochemical Co. have announced that they have agreed on a plan to construct two vapour-phase-process polypropylene (PP) plants one after the other by joint investment and have "declared" this to the Ministry of International Trade and Industry (MITI). Such declaration is necessary for MITI to supervise the industry's operations.

According to the plan, the two companies and Dia Polymer Co. — the two companies' joint firm for polyethylene and PP sales — will set up a new company for investment in the planned PP-plant construction and operation of the plants. The first plant with a 50,000 t/y capacity will be constructed at the Mizushima factory of Mitsubishi Kasei (MK) using the vapour-phase process developed by MK. Construction is scheduled to start in April 1990 with operation start-up slated for the middle of 1991.

The second plant with an 80,000 t/y capacity will be built at the Kashima factory of Mitsubishi Petrochemical (MP) with start of construction set for December 1991 and operation start-up for the middle of 1992. It will adopt the vapour-phase process developed by combining MP's technology and a foreign one. When the plant is put into operation, MP will stop operating its existing 30,000 t/y PP plant.

The combined PP-capacity expansion of the two companies will thus come to 100,000 t/y. "The PP shortage is serious here and we have reached agreement on the 2-plant construction in the presence of our joint sales company. As there is an interval between construction of the first plant and that of the second, I believe this will cause no market confusion", says President Masaki Yoshida of Mitsubishi Petrochemical.

CHUGOKU ELECTRIC BEGINS TO BUILD METHANOL PLANT

Chugoku Electric Power Co. said it has begun constructing an experimental methanol power plant to help reduce the contamination of urban air and the global atmosphere. Methanol, otherwise known as wood alcohol, is a cleaner burning fuel than oil and could lessen Japan's dependence on foreign energy sources.

The methanol plant is being constructed in Hiroshima Prefecture, with assistance from Japan's New Energy Development Organistion (NEDO), a government organ which is researching and developing alternate energy sources to oil and fossil fuels.

The plant system heats a mixture of methanol and water to generate hydrogen and carbon dioxide. These gases are then compressed and ignited to power the turbine generator. The plant will have a 1 megawatt output capacity when construction is completed around March 1991 at a cost of about ¥2.5 billion, a company official said.

MITSUI TO BUILD AMORPHOUS POLYOLEFIN PLANT

Mitsui Petrochemical Industries, Ltd. is scheduled to construct a 10,000-t/y plant for inhouse-developed amorphous polyolefin resin (trade name: "Zexel") at its Iwakuni-Ohtake factory.

The company intends to market the product for use in the manufacture of household electrical appliances and automobiles: it will be employed as a substitute for quasi-versatile engineering plastics including ABS and modified polyphenylene oxide.

Mitsui Petrochemical Industries envi-ages promoting the product, as well as "MCX-A" superengineering plastic and "APO" amorphous polyolefin to the point where it becomes a mainstay item in its engineering-plastics opera-ions.

Zexel has the following advantages: 1. good appearance, 2. strong thermal resistance, 3. dimensional stability, 4. low water-absorption capacity and 5. tough weather resistance.

JAPAN FIRM OBTAINS SALES RIGHTS TO U.S. DNA PROBE-BASED REAGENTS

Nissui Pharmaceutical Co. has obtained the exclusive sales and mar-keting rights for Japan for clinical rea-gents and a diagnostic system based on nucleic acid-probe technology from GENE-TRAK Systems (U.S.). GENE-TRAK is an American joint venture between Amoco and Genzyme Corp. (both U.S.).

Under the agreement, the Japanese firm will provide the U.S. firm with R & D funds for nucleic acid probe-based diagnostic products and will work together with it for commercial devel-opment of such products for the Japa-nese market, in exchange for the exclusive Japanese sales rights for the products to be developed from now on.

Nucleic acid probe-based clinical reagents are believed to be superior to conventional reagents based on the antigen-antibody reaction with regard to both specificity and accuracy, and so are expected to create a large market in future.

Nissui hopes to be able to start mar-keting such products in five or six years for diagnosis of infectious diseases caused by Salmonella, listeria and AIDS virus, etc. The size of the funds to be offered by the U.S. firm is not known as yet.

ETHYLENE COST HIGHER IN JAPAN THAN IN S. KOREA, U.S.

Japan Economic Research Institute attached to The Japan Development Bank recently estimated the cost com-petitiveness of ethylene produced in Japan, S. Korea and the United States. It has concluded that combined produc-tion cost for ethylene in 1989 will be the highest in Japan, followed by the States and S. Korea, provided all of them use naphtha as raw material and crude oil prices are set at $10-30 bbl.

Prices for raw material naphtha account for roughly 70% of the total production cost for Japanese-made ethy-lene. In Japan, raw material prices and running costs including fuel cost are generally high due to freight and unique pricing systems for oil products. In addi-tion, fixed costs and personnel expen-ses are higher in Japan than in the other two countries.

Japan's ethylene industry is now earning large profits but its fundamental competitiveness is low. It will suffer from a decline in plant operation rates and weakening of market prices for ethylene if crude-oil prices rise further. The institute points out that the indus-try should diversify supplies of raw materials and enhance bargaining power for them so that it can revamp its fra-gile profit-earning structure. It also advises the industry to build brand-new plants, thus reducing production cost and building up an international com-petitive edge.

In S. Korea, raw material cost is lower than in the U.S. since the S. Korean government has enforced a ceiling-pricing system. Ethane is staple raw material for ethylene in the States. In actuality, the total production cost for ethylene is lowest in the U.S. since ethane has a high yield ratio for ethy-lene. It is, however, difficult to estab-lish simple comparisons with regard to the production cost of ethylene pro-duced in the States, S. Korea and Japan, since the latter two employ naphtha as raw material for ethylene. Price regula-tions for ethane have been virtually lifted in the U.S. As a result, ethane has not gained an advantage over naphtha pricewise.

MARUBENI TO SET UP NEW AGROCHEM PRODUCTION BASE IN MALAYSIA

Marubeni Corporation recently acquired 25% of the total shares of ANCOM, a Malaysian agrochemical manufacturing company. The purpose of this step is to increase the supply of raw materials to Malaysia and streng-then agrochemical sales power in that country. Marubeni has already started investment in ACM, a joint enterprise established in Malaysia in cooperation with Nihon Nohyaku Co. So, its acqui-sition of the shares of ANCOM is its second step to start a joint agrochem-ical enterprise in Malaysia. Marubeni's investment will enable ANCOM to start the construction of a new herbicide plant at North Port Crown.

Marubeni has been speedily pushing ahead with its overseas production and sale of agrochemicals since it purchased Helena Chemical, an American manu-facturer and distributor of agrochemi-cals, in 1987. Its recent investment in ANCOM, too, is part of such overseas activities. It will step up such activities further hereafter.

ANCOM maintains its head office and plant at Shahalum. It is engaged in the production of agrochemicals cent-ered on herbicide to be used for rubber, palm and coconut plantations. Its annual sales amount to 30 million Malaysian dollars. The new plant constructed at North Port Crown is to lay major emphasis on herbicide production. Mar-ubeni aims at increasing the supply of raw materials to ANCOM and streng-thening its agrochemicals sales power in Malaysia.

It is said that annual sales in Malaysia's agrochemical market amount to M$200 million (about ¥10 billion) and that herbicide for plantations accounts for 80% of this amount. The share of herbicide and insecticide for paddy fields is still small. It seems that Marubeni, too, has started investment in ANCOM for the purpose of increasing the production and sale of herbicide for plantations.

THAI NPC2 PROJECT TO TURN OUT 350,000 T/Y OF ETHYLENE

All the details of Thailand's NPC2 project have been clarified. Recently, "Thai Olefins Company" has been founded for production of ethylene and propylene, and a feasibility study (FS) has been started. It is said that this company's plant will use naphtha as the main feed and can use LNG and light naphtha as well, for annual production of 350,000 tons of ethylene and 270,000 tons of propylene. According to the present schedule, the plant will be completed in 1993.

As for the investment ratio concerned, 51% will be provided by governmental organs (40% by PTT and 11% by NPC). The remaining 49% will be offered by derivatives producer companies, the names of which have already been revealed, in accordance with the amount of ethylene and propylene to be taken over by the respective companies. In addition, "Thai Aromatic Company" will be founded for production of aromatics. According to the present plant, this company will build a plant at Si Racha.

The Thai petrochemical project consists of the NPC1 project and the NPC2 project. NPC1 project was started first. Already completed are facilities for producing 315,000 tons of ethylene by means of ethane cracking and 160,000 tons of propylene by means of dehydrogenation of propane via the UOP process, and those for producton of suc derivatives as polyethylene and poly propylene.

In the case of NPC2, investment i facilities for production of derivative has been approved by BOI (Investmen Committee) of Thailand. Those com panies which are to turn out derivative will receive the remaining 49% of th total investment to be made by Tha Governmental organs in accordanc with the amount of ethylene and pro pylene they will take over, for invest ment in Thai Olefins Company.

Also, Thai Aromatic Company wil become a joint venture, with semigo vernmental PTT, Exxon Corp. and semigovernmental Thai Oil Company as investors. In the case of the HDPE plant, Mitsui & Co. has joined the group led by the Bank of Bangkok of Thailand. According to the present schedule, NPC2's olefin plant will be completed in 1993.

New Developments from Japan

NEW SYNTHESIS PROCESS FOR ß-SiC POWDER BARED

Researchers at National Institute for Research on Inorganic Materials have developed silicon-carbide precursor —in which silica (SiO_2) and carbon are uniformly blended with each other —using phenol resin and ester silicate.

In addition, they have succeeded in processing the product into high-purity ß-SiC powder, which requires no decarbonization process and can be sintered with the addition of small amounts of boron/carbon (B/C) auxiliaries. Using an X-ray analysis method, they have confirmed that the powder has a single ß-SiC phase.

They obtained high-density (3.1g/cm³) sinter by adding B/C auxiliaries to the ß-SiC powder at the ratio of 0.15 and 2% respectively. General Electric (U.S.) has a patent on the adding of boron (0.3-1%) and carbon (0.1-1%) to ß-SiC but the Japanese researchers claim that their technology does not infringe the U.S. patent.

Studies are being energetically conducted in Japan on how to develop SiC sinter. Laser-synthesis, CVD, pyrolysis and silica-reduction methods have already been pioneered but only the last is employed on a commercial basis. In this method, SiO_2 and carbon are utilised as starting materials as in the case with the above mentioned new technology but the ß-SiC sinter produced using the silica-reduction method requires a decarbonisation process. Japanese companies have hitherto endeavoured to pioneer ß-SiC sinter without infringing GE's patent.

KAO PIONEERS SCALE INHIBITOR FOR SEAWATER DESALINATION

Kao Corp. has developed and successfully tested a scale inhibitor for seawater-desalinating plants based on the multistage flash method. The tests were conducted at a plant of Dubai Electricity Company located in the Jabel Ali area in Dubai, United Arab Emirates with the co-operation of Sumitomo Heavy Industries, Ltd.

The multistage flash method produces fresh water by heating seawater, evaporating moisture contained therein by means of evaporators and concentrating the resultant vapour into fresh water. It has the economic advantage of utilising excess heat produced by the power-generation boiler and therefore has increasingly been used in large-sized facilities.

It however, requires large energy consumption and, what is worse, extracts inorganic substances from seawater, which adhere to the desalination plant, particularly to surfaces inside the pipes and consequently reduce the heat conductivity of the pipes. Ingredients of the scale include calcium carbonate, magnesium hydroxide and calcium sulphate. It is usually necessary to remove the scale that has adhered by completely cleaning the pipes with acid once every twelve to 18 months.

The new agent (trade name: Aquakreen KC-550), if added to seawater at 2-5 ppm, inhibits growth of layered crystals (scales) and transform them into spherical shapes. It consequently facilitates elimination of scales and reduces their adhesion to surfaces inside the pipes. As a result, deterioration of heat conductivity can be greatly prevented. In particular, it is significant that the product has made it possible to inhibit adhesion of magnesium hydroxide and calcium sulphate, both of which are usually difficult to remove.

The agent is maleic acid copolymer incorporating surfactants, which serve as hydrophilic groups. The company expects it to command 50% of the world market for scale inhibitors and attain annual sales of ¥5,000 million.

JAPANESE, U.S. FIRMS TIE UP FOR ANISOTROPIC-GRAPHITE BUSINESS

Toyo Carbon Co., Pfizer Inc. (U.S.) and Pfizer MSP — Pfizer's Japanese subsidiary — have concluded a formal agreement on broad co-operation in fine-carbon business.

In accordance with the agreement, Toyo Carbon will serve as general agency in Japan for the U.S. company with regard to anisotropic-graphite operations. Toyo Carbon will import finished products from Pfizer and, in addition, buy raw-material plates from the same company and subject them to thermal treatment. The Japanese company, together with Pfizer MSP, is scheduled to exploit application fields for anisotropic graphite.

Toyo Carbon and Pfizer intend to jointly develop new-type anisotropic graphite and related products and establish in Japan a production company on an equal-ownership basis two or three years hence. They are aiming at applying anisotropic graphite to atomic power plants, nuclear fusion and the manufacture of semiconductors and medical-use products including biomaterials.

Pfizer's anisotropic graphite (trade name: Pyroid) is produced by depositing methane gas within a high-temperature vacuum furnace using a chemical-vapour-deposition process. The product is a lamination of carbon layers, in which a carbon atom is firmly combined with three other atoms. Each layer is loosely connected to the next. Pyroid shows high thermal conductivity in the horizontal direction but transfers hardly any heat in the vertical direction. The heat-transfer ratio between the horizontal and vertical directions stand at 200:1.

The product has only a tiny metal content (below 5ppm) and high capacity

for removing gas from targeted material and is so tough that it does not creep at high temperature. Toyo Carbon and Pfizer are the world's largest producers of isotropic and anisotropic graphites, respectively.

ANTISTATIC POLYPROPYLENE FIBER PIONEERED: MITSUBISHI RAYON

Mitsubishi Rayon Co. has developed polypropylene (PP) fiber (trade name: Roval) having an ultrahigh antistatic property and begun to market the new product for use in carpeting. The new type fiber is produced by adding electroconductive material (carbon black) to PP resin and spinning the resultant product. The company has imparted the bulkiness needed for carpeting to the product by means of a mechanical crimping process. The fiber thereby obtained has chemical resistance, colour fastness to light and abrasion resistance. It consists of four 50-denier filaments and has electrical resistance of 10^8 ohm/cm.

When combined with carpeting-use PP fiber in small quantities, the product serves to keep down the voltage of static electricity with which the human body is charged to below 1kV. In cases where the new product is added to target fiber at the ratios of 0.2 and 2.4%, the said voltage stands at 1.2 and 0.3 kV, respectively. It, therefore, facilitates production of antistatic carpeting usable, for example, for computer rooms.

A few major Japanese carpeting makers have employed the product for office-use carpeting. When a man walks on carpeting, friction between his slippers or shoes and the carpeting itself produces static electricity and he is charged with the electricity thereby generated. When the voltage concerned exceeds 3kV, he occasionally receives an electrostatic shock, induces errors in computers and damages floppy disks. There is a move toward limiting the voltage of static electricity — with which people are charged through contact with carpeting in computer rooms — below 1kV. Bulked continuous filament nylon commands the major part of the domestic market for carpeting materials but the company intends to thrust deeply thereto using the new product, which is expected to exploit non-apparel application fields for synthetic fiber.

DRUG FIRM LINKS WITH INK MAKER FOR ANTIKIDNEY-DISEASE AGENT

Yamanouchi Pharmaceutical Co. has reached an agreement with Dainippon Ink & Chemicals Inc., (DIC), a leading Japanese ink maker, with regard to joint clinical development of DIC's agent effective against kidney diseases. Yamanouchi will commence clinical tests on the agent within the first half of next year and then, on another type of anti-kidney-disease agent it has developed its own. DIC's agent is said to have good effects for a wide range of diseases caused by kidney trouble and some other organs such as nephritis and pyelitis. As it also has few side effects it is expected to be used for chronic kidney diseases. Yamanouchi's agent likely to appear thereafter is said to be effective against acute or severe kidney diseases.

Kidney diseases have been increasing in Japan and the West and this trend is expected to continue in future. With two types of agents, Yamanouchi believes it will be able to secure a footing in the world market for antikidney-disease drugs. Along with this, the company will put into clinical testing its new type-TPA (tissue plasminogen activator), called 2nd-generation TPA, which has been obtained by modifying a part of the amino acid sequence of existing TPA to prolong its activity as an antithrombosis agent.

BORIDE-APPLIED CERMET FOR CASTING MOLDS BARED BY ASAHI GLASS

Asahi Glass Co. has developed "UD-II" cermet having strong corrosion resistance and a high level of strength at high temperature. The company — together with a domestic die-casting maker — has successfully established a precision casting method using the new product as material for molds for pressure casting.

The new type cermet is endowed with the rigidity and high temperature stability of ceramics and the toughness and reliability of metal. Asahi Glass intends to expand application of the product to heat-resistant structural materials and material for molds for casting aluminium and copper in particular. The company has a 500-kg/m pilot plant in Yokohama. It has plans to build a 2-3 t/m plant next year and attain related annual sales of ¥1,000 million in fiscal 1991.

UD-II cermet is produced from molybdenum boride compound (composition ratio, 1:1) and nickel, both of which are heated and sintered at a temperature of between 1,300 and 1,500°C. It is "wet" when in contact with molten metal and has a satisfactory degree of toughness. Boride-based cermet now in use is a fragile compound lacking "wettability".

Cermet is composite material consisting of ceramics (main component) and metal: it has properties intermediates between those of ceramics and metals. Conventional type products incorporate carbide material as ceramic components and need to be improved in their thermal shock resistance and fracture toughness.

UD-II cermet maintains a high level strength (200kg/mm²) within a temperature range of between room temperature and 800°C, attains at room temperature high-level strength and tenacity equivalent to those of high-tenacity ultrahard metal alloy and shows strong corrosion/abrasion resistance when brought into contact with aluminium, zinc and copper alloy.

MARKET INFORMATION

Markets Dull

Markets remained dull with prices of most chemicals maintaining their previous level. Except for rangolite German which recorded a sharp increase of Rs. 8 at Rs. 90 + ST and titanium dioxide anatase cheaper by Rs. 5 at Rs. 80 + ST offtake was poor. Solvents were steady & easy availability of intermediates ensured good supply to dyes exporters.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on December 26, 1989)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	2.50
Ammonium phosphate (Mono)	14.50
Ammonium phosphate (Di)	14.00
Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	5.60
Ammonium chloride	4.00
Ammonium nitrate	6.00
Arsenic white powder	22.00
Acrylamide (Resale)	70.00
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.20
Borax (Granular)	20.00
Borax (Powder)	22.00
Boric acid (Tech)	26.00
Bisphenol-A	70.00
Butyl carbitol	110.00
Caustic soda (Flakes)	13.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	300.00
Cresylic acid	62.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	47.00
Copper sulphate	25.00
Chromic acid	63.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	110.00
Hydro	44+ST

Hyflosupercell	19.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	20.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	40.00
Mercury (34.5 Kgs)	10,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	16.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	34.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	23.00
Phthalic anhydride 36% (Resale)	24.25
Pentaerythritol (Resale)	45.00
Paraffin wax	19+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	78+ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	730.00
Sodium chlorite 80% (Spain)	85.00
Soda Ash (Tata)	4.80
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	320.00
Titanium Dioxide (Anatase)	80+ST
Titanium Dioxide (Rutile – RCR_2)	112+ST
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	86.00
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	35.00
Acetone (Resale)	22.00
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	50.00
Benzoate Plasticiser	62.00
Butyl acrylate	89+ST
Butyl stearate	45.00
Butanol	35+ST
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	60.00
Chloroform	31.00
Carbon Tetrachloride	21.00
Cellosolve	58.00
Cyclohexanone	52.00
Cyclohexanol	58+ST
Diacetone (Resale)	34.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG)	32.00
Dioctyl Phthalate	45.00
Diallyl Phthalate	46.00
Dimethyl Phthalate	28.00
Dioctyl Adipate	52.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	26.00
Dimethylamine 50%	30.00
Ethyl Acetate	22.00
Ethyl Acrylate	72.00
Ethylene Dichloride	14.50
Ethylene Glycol	42.00
Formic Acid (Imp.)	24.00
Formaldehyde (Resale)	7.50
Glycerine (CP)	55.00
Glycerine (IW)	53.00
Hydrogen Peroxide 50% (Resale)	26.00
Isopropyl Alcohol	29.00
Isobutyl Alcohol (Resale)	30.00
Monoethanolamine (Resale)	80.00
Melamine	62.00
Methyl Ethyl Ketone	32+ST
Methyl Isobutyl Ketone	58.00
Methyl Acrylate	66.00
Methylene Dichloride (Resale)	16.00

Carbitol	60+ST
Meta Cresol	45.00
Nitrobenzene	25.00
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	36.50
Propylene Glycol	55.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	68.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	37+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	71.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	10.80
N-Heptane	10.50
N-Hexane	13.00
Methanol	9.50
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	13.50
Xylene	18.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)	
Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	185.00
Aceto Acetic Ester (Methyl)	64.00
Ammonium Molybdate	210.00
Anthraquinone	115.00
Anthranilic Acid	77.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	255.00
Beta Naphthol (Atul)	72.00
Benzidine Dihydrochloride (BDH)	96.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	345.00
Coach Acid	55.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	128.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
Diethyl Aniline	165.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB (Imp.)	180.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	120.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	355.00
J. Acid Urea	425.00
K. Acid	125.00
MPDS (German)	185.00
MNA	
Meta Ureido Aniline	235.00
MPD (Local)	215.00
MPD (Japan)	230.00
Naphthenic Acid	40.00
N-Methyl J. Acid	610.00
N-Methyl Aniline	125.00
Naphthalene (Refined)	20.00
Ortho Anisidine (OA) (Imp.)	108.00
Ortho Dichloro Benzene (ODCB)	16.00
OT Base	130.00
Para Dichloro Benzene (PDCB)	32.00
Para Anisidine (PA local)	152.00
PNA	118.00
Para Cresidine (Imp.)	410.00
Para Amino Azo Benzene (India)	170.00
PNCB	60.00
Para Amino Acetanilide	190.00
1-Phenyl 3-Methyl 5-Pyrazolone	155.00
Phenyl J. Acid	350.00
Para Amino Benzoic Acid	135.00
PT Base	155.00
Rhoduline Acid	550.00
Resist Salt 80%	28.00
Resorcinol	210.00
Sodium Naphthionate	67.00
5-Sulpho-Anthranilic Acid	82.00
Sulphanilic Acid	41.00
Sulpho Tobias Acid	170.00
Trichloro Benzene (TCB)	22.00
Tobias Acid	165.00
Metanilic Acid	43.00
MTD	120.00

Bombay Dyes Market

(Prices as on December 26, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red CB Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	128.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	2*2.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60

ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2002.35
ASBT	2459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow MGR	387.65
Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M3R	244.70
Brill. Orange H2R	303.80
Brill. Red H7B	157.95
Brill. Orange M2R	313.15
Brill. Red H8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H3R	333.75
Blue H 5RX	286.20
Navy Blue M3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	09.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Powder Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D. Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: DEC. 22, (NNS) Tartaric acid France fell sharply by Rs. 400 at Rs. 13,800 per 50 kg in the Delhi chemicals market during the week under review, on account of increased import from France as well as fall in demand from paneer manufacturers, says NNS. Tartaric acid Trishul marka came down by Rs. 50 at Rs. 4,150 (per 15 kg) in view of comfortable stock position. Offtake was also poor in citric acid at Rs. 2,150/2,375 (per 50 kg).

Borax granular and crystal came down by Rs. 15 at Rs. 835 each per 50 kg owing to poor demand by local and outside traders. As a result of poor enquiries, boric acid technical slipped by Rs. 50 at Rs. 1,400. Caustic soda flakes moved down by Rs. 5 at Rs. 505 because of poor export demand.

Rangolite Germany tumbled down by Rs. 3 at Rs. 87 per kg following increased import and negligible demand from textile units. Sufolite was being offered lower at Rs. 78 against Rs. 82 and chatkolite decreased by Re. 1 at Rs. 66. Inspite of good demand from gur and khandsari makers, sodium hdyrosulphite, Damosha and Tamil Nadu softened by 50 paise at Rs. 35 each per kg. Hydro Kalali and Gulshan ruled quiet at Rs. 36.50 and Rs. 34 per kg. Following restricted demand from plastic and paint units and increased offerings between stockists and distributors induced by stringent money condition. Titanium dioxide anatase, RC-822 and RCR-2 eased by Rs. 1/2 at Rs. 83 and Rs. 98 each per kg. K brand of Calcutta side ruled quiet at Rs. 76 per kg.

Stable bleaching powder KCl suffered a fall of Rs. 5 at Rs. 90 per 25 kg due to poor enquiries while Modi sold higher at Rs. 92 against Rs. 90 in view of tight stock position. Soda bicarb slipped by Rs. 2/3 at Rs. 290/295 due to poor offtake. Sodium nitrite went up by Rs. 50 at Rs. 800/900 owing to tight stock position. In the wake of poor arrivals from Sambhal, Muradabad, Rampur, Amroha, and Chandousi areas of U.P. as well as sustained export demand, menthol bold, flake and medium hardened by Rs. 10/15 at Rs. 370, Rs. 360 and Rs. 330 per kg. Mentha oil rose by Rs. 10 at Rs. 245/265 and DMO traded higher at Rs. 120 against Rs. 110 per kg. As a result of higher advices from Bombay, mercury held steady at Rs. 10,700 per flask. No variation was noticed in dyes and colours.

(DELHI MARKET RATES AS ON DECEMBER 22, 1989)

Ammonia Bicarb (Per 25 Kg.)	140.00
Mercury (Per flask)	10,700.00
Soda ash (Per bag)	343/350.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	505.00
Citric acid (Per 50 Kg.)	2,150/2,375.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00
Sodium Bicarbonate (50 Kg.)	290/295.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	67.00/87.00
Boric acid Technical (Per 50 Kg.)	1,400.00
Paraffin Wax (Per 50 Kg.)	850.00
Tartaric Acid (Trishul Per 15 Kg.)	4,150.00
Borax Granular (Per 50 Kg.)	835.00
Borax Crystal (Per 50 Kg.)	835.00
Sodium Nitrite (Per 50 Kg.)	800/900.00
Sodium Nitrate (Per 50 Kg.)	450.00
Camphor Thal (Per Kg.)	103.00
Camphor Powder (Per Kg.)	93.00
Menthol Bold (Per Kg.)	370.00
Menthol Medium (Per Kg.)	360.00
Menthol Flake (Per Kg.)	330.00
Glycerine (Per Kg.)	55/58.00
Sodium Silicate (Per quintal)	275/350.00
Hexamine (Per Kg.)	35.00
Acetic Acid Glacial (Per Kg.)	15.00
Copper Sulphate (Per quintal)	2,400/2,750
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	26.50/27
Calcium Carbonate (Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	28.00
Acid Slurry Hard (Per Kg.)	38.00
Phosphoric Acid (Per 50 Kg.)	1,050.00
Potassium Nitrate (Per quintal)	900/1,200.00
Potassium Permanganate (Per 50 Kg.)	2,800/3,200.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	600.00
Titanium Dioxide Anatase (Per Kg.)	83.00
Titanium Dioxide RC-822 (Per Kg.)	98.00
Titanium Dioxide K-Brand (Per Kg.)	76.00
Titanium Dioxide RCR-2 (Per Kg.)	98.00
Zinc Oxide (Per metric tonne)	42,000/52,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.75
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	3,200/3,700.00
Naphthalene Balls (Per 50 Kg.)	1,525.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/201.65
Naphthol ASG	180/295.20
Naphthol ASBS	210/248.45
Naphthol ASTR	275/360.45
Naphthol ASOL	210/238.60
Naphthol ASBO	195/260.75

DIRECT DYES	(Per Kg.)
Black E. Conc.	120/176.90
Diazo Black B.T.	105/147.55
Green B	90/140.55
Blue 2-B	60/101.40
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/235.05
Basic Auramine	55/110.00
Basic Rhodamine	300/425.00
Basic Methylene Blue	100/180.00
Basic Violet	165/180.00
Basic Malachite Green	175.00
Acid Orange	75/111.20
Congo Red H/C	75/120.95

Madras Market

The market witnessed a fall in almost all prices. The slide in prices of caustic flakes continued in spite of the proposed heavy power cut in Andhra Pradesh. Titanium dioxide prices also fell by Rs. 5 per kg on better availability. Also there has been a marked fall in prices of oxalic acid which came down to Rs. 20 from Rs. 24 on free availability. Some new manufacturers have also come in the field. Similarly soda ash prices also came down on pressure selling. M/s. J.B.F. Synthetic's new plant for manufacture of trichloroethylene has gone on stream and the materials have started coming out. Reports about the quality and acceptance by consumers are eagerly awaited.

(MADRAS MARKET RATES AS ON DECEMBER 23, 1989)

Acetic Acid Glacial (per kg)	16.00
Aluminium Sulphate Iron free (per MT)	4,000.00
Ammonium Bicarbonate (per 25 kgs)	140.00
Ammonium Chloride (per MT)	2,800.00
Acid Slurry (per kg)	31.00
Barium Carbonate (per kg)	9.00
Barium Chloride (per kg)	8.00
Boric Acid Technical (per kg)	26.00
Bleaching Powder (per 50 kgs)	220.00
Borax (per 50 kgs)	900.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	10,800.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	10,800.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,750.00
Calcium Carbonate (Activated) (per MT)	6,000.00
Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	25.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	85.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	24.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	50.00
Hydrosulphite of Soda (TCPL) (per kg)	38.00
Hydrosulphite of Soda (IDI) (per kg)	42.00
Hydrosulphite of Soda (BASF) (per kg)	42.00
Hexamine (per kg)	30.00
Hyflosupercell (per kg)	21.00
Hydrogen Peroxide (per kg)	32.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	19.00
Magnesium Chloride (per kg)	3.50
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	380.00
Oxalic Acid (per kg)	20.00
Paraffin Wax (per kg)	18.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	25.00
Polyvinyl Alcohol Powder (per kg)	130.00
Pentaerythritol (per kg)	50.00
Phthalic Anhydride (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	350.00
Soda Ash (TATA) (per 75 kgs)	350.00
Sodium Bicarbonate (TATA) (per 50 kgs)	360.00
Sodium Silicate (per MT)	3,250.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	75.00
Titanium Dioxide (Rutile) (per kg)	85.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	50.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	7.00

SOLVENTS

Acetone -- HOCL (per kg)	22.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	42.00
Benzene (per lit)	14.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	24.00
Chloroform (per kg)	29.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	42.00
Dichloroethane (per kg)	18.00
Di-octyl Phthalate (per kg)	46.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	23.00
Isopropyl Alcohol (per kg)	30.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	34.00
Methyl Isobutyl Ketone (per kg)	42.00
Phenol (per kg)	38.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	64.00
Trichloroethylene (per kg)	26.00
1-1-1 Trichloroethane (per kg)	29.00
Turpentine (per lit)	16.50
Toluene (per lit)	17.00
Xylene (per lit)	25.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
28/12	Dorothee	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & all destination in U.K.; Benelus; Germany; Italy; France; Switzerland & Austria. (Carting at M.O.D. No. 2 for Merzario). (Carting at M.O.D. No. 1 for Samrat & Hindustan).	5/1
28/12	Tilia	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah. (Carting at 14-VD for containers).	5/1
29/12	Mette Sif (Dan) (V-801)	Marine Trans/	Antwerp; Rotterdam; Hamburg; Bremen; Le Havre; Felixstowe; Hull; Rostock; London; Liverpool; Avonmouth; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Malmao; Norkopping; Helsingburg; (Including inland destinations for above ports). Lattakia; Limmasol; Izmir; Mersin; Istanbul; Beirut; Marseilles; Valencia; P. Sai; Casablanca; Alexandria; Piraeus; Solonki; Iraqi ports. (Carting at T.P. No. 3).	3/1
		Khemka/	Larnaca; Mersin; Izmir; Casablanca; Genoa; Lattakia; Alexandria; Istanbul; Las Palmas & Teneriffe; Antwerp; Rotterdam; Hamburg; Bremen; Gdansk; Le Havre; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Malmao; Helsingburg; Helsinki; Kotka. (Carting at Wadi Bunder No. 3).	
		M.C.S./	Jeddah; Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Gdynia; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo. (Carting at H.B. No. 4).	
		Ranadip	Jeddah; Palermo; Naples; Livorno; (Leghorn) Marseilles (Fos); Genoa; Barcelona; Bilbao; Valencia; Alicante; Algiers; Lisbon; Leixoes; Bremerhaven; Le Havre; Antwerp; Rotterdam; Bremen; Hamburg; Aarhus; Pireus; Gothenburg; Oslo; Copenhagen; Stockholm; Helsinki; Felixstowe; Tilbury; London; Avonmouth; Dublin; Belfast; Grangemouth; Liverpool; Manchester. (Carting at M.O.D. No. 3).	
29/12	Seacrest Achiever (Ger) (V-204)	Merzario/	Jeddah; Hodeidah; P. Sudan; Ravenna; Ancona; Piraeus; Venice; Trieste. (Carting at M.O.D No. 2).	6/1
		Seaspeed/	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian ports. (Carting at Hay Bunder No. 3).	
		L. Triest/	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting M-171/173 C.D.)	
		Oceanic/	P. Said; Limassol; Alexandria; Casablanca; Tripoli; Livorno; Genoa; Mersin; Iskendren; Izmir. (Carting at Wadi Bunder No. 3).	
		Killick	Jeddah; Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam; Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia; Marseilles; Barcelona. (Carting at M-178/180 cotton depot).	
2/1	Integra	P & O/	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	6/1
		Arebee	Alexandria; Piraeus; Venice; Trieste; Koper; Naples; Fos; Barcelona; Valencia; Livorno; Las Palmas; Limmasol. Constanza Budapest. (Carting M-Jetha C.D.).	
4/1	Lanka Abhaya	Seahorse	Hodeidah; Jeddah; Aqaba; Alexandria (Direct); Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Glasgow; Wembly; Liecester; Immingham; Birmingham; Leeds; Antwerp; Bremen; Copenhagen; Gothenburg; Hamburg; Rotterdam; Oslo; Stockholm; Helsinki; Aarhus; Malmao; Norkopping. (Carting at M.O.D. No. 3).	8/1
6/1	Archimedes (Nhava Sheva)	Patvelk/ S.W. & Co.	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles;	8/1

(1)	(2)	(3)	(4)	(5)
		Trident/ P & O	Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at Kalamboli for all).	
4/1	Lanka Abhaya	Seahorse	Colombo. (Carting at M.O.D. No. 3).	8/1
25/12	S/o. Tripura (Ind)	S.C.I.	Main Japan ports.	4/1
29/12	Mette Sif	Marine Trans/	Singapore; Hong Kong; Busan; Kobe; Tokyo; Djakarta. (Carting at T.P. No. 3).	3/1
		M.C.S/	Far East & Japan ports. (Carting at H.B. No. 4).	
		Ranadip/	Far East & Japan ports. (Carting at M.O.D. No. 3 for Ranadip).	
		Khemka	Singapore; Hong Kong; Busan; Tokyo; Kobe. (Carting at W.B. No. 3).	
2/1	Ocean Sincerity (V-19A/B) (Lib)	O.S.A./	P. Kelang; Singapore; Kaohsiung; Hong Kong; Bangkok; Kobe; Yokohama; Nagoya; Moji; Osaka; Busan; Tokyo; Simizu; Keelung; Tsingtao; Quindao; Xiangang; Shanghai. (Carting M-178/180 C.D. For O.S.A).	7/1
		M.S.P.L.	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Manila. (Carting at Hay Bunder No. 4).	
4/1	Lanka Abhaya	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hong Kong; Keelung; Kobe; Yokohama & FCL only Busan; Inchon; Osaka; Tokyo; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).	8/1
29/12	Mette Sif	M.C.S.	Sydney; Melbourne; Brisbane; Burnie; New Castle. (Carting H.B. No. 4).	3/1
2/1	Ocean Sincerity	O.S.A.	Sydney; Melbourne; Adelaide; Brisbane; Fremantle; Auckland; Wellington; Lyttleton; P. Chalmers. (Carting at M-178/180 cotton depot).	7/1
4/1	Lanka Abhaya	Seahorse	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting M.O.D. No. 3).	8/1
29/12	Mette Sif (V-801)	Ranadip	Dubai; Muscat; Abu Dhabi; Doha; Dammam; Bahrain; Kuwait. (Carting at M.O.D No. 3).	3/1
25/12	Al Khansaa	Al Rafidain	Umm Qaser (Iraq).	3/1
28/12	Tilia (V-62) (Cyp)	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha. (Carting at 14-VD for containers).	5/1
29/12	Seacrest Achiever (Ger) (V-204)	Parekh/	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4).	6/1
		Merzario/	Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; Bahrain. (Carting at 14-VD for Merzario).	
		L. Triest/	Dubai; Dammam; Riyadh; Muscat; Abu Dhabi; Doha; Kuwait; Bahrain; (Carting at 171/173 cotton depot for L. Triest).	
		Seaspeed	Dubai; Dammam; Bahrain; Kuwait; Doha. (Carting at H.B. No. 5).	
29/12	Lindesnes (Nor)	I.L.S.A.	Dubai. (Carting at C-PD).	6/1
4/1	Lanka Abhaya	Seahorse	Dubai; Khorfakkan; Sharjah; Muscat; Dammam; Riyadh; Kuwait. (Carting at M.O.D. No. 3).	8/1
2/1	Integra (V-14) (Pan)	Arebee/	Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali; (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Zanzibar. (Carting at M.J.C.D.).	6/1
		P & O	Mombasa; Dar Es Salaam (Direct); Beira; Mahe and inland destinations in East Africa. (Carting at Timber Pond No. 4).	
29/12	Mette Sif (Voy-801)	Marine Trans/	Boston; New York; Baltimore; Norfolk; Charleston; Port Everglades; Jacksonville; Galveston; Houston; Los Angeles; Toronto; Montreal; Philadelphia; Savannah; New Orleans; South & Central American ports. (Carting at T.P. No. 3).	3/1
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Galveston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Tempa; New Orleans; Providence; San Diego; Oakland; Sanfrancisco; Stockton; Chicago; Detroit; Cleveland; Milwaulkee; Columbus; Kansas City; Atlanta; Nashville; Dallas; Minneapolis. (Carting at Hay Bunder No. 4).	
		Ranadip	New York; (Elisabeth); Portsmouth (Norfolk); Baltimore; Charleston; Boston; Philadelphia; Houston; New Orleans; Jacksonville; Savannah; Wilmington (N.C.); Mobile; P. Everglades; (Miami); Los Angeles; (Longbeach); Oakland; Portland; Seattle; Anchorage; Montreal; Quebec; Ontario; Toronto via Halifax; Vancouver; Detroit also Caribbean & Mexican ports. (Carting at M.O.D. No. 3).	

(1)	(2)	(3)	(4)	(5)
29/12	Seacrest Achiever (Voy-204)	Seaspeed/	New York; Baltimore; Norfolk; Savannah; Charleston; Houston & S. American ports. (Carting at Hay Bunder No. 3).	6/1
		Oceanic	New York; Baltimore; Philadelphia, Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston & other inland destinations. In U.S.E. Coast & S. American ports. (Carting at Wadi Bunder No. 3).	
2/1	Ocean Sincerity (V-19A/B)	O.S.A.	New York; Baltimore; Philadelphia, Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; Sanfrancisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma & S. American & W. Indies ports. (Carting M-178/180 cotton depot).	7/1
4/1	Lanka Abhaya	Seahorse	New York; Baltimore; Charleston; Norfolk. (Carting at M.O.D. No. 3).	8/1
6/1	Archimedes (Nhava Sheva)	Patvolk/ P & O/ S.W. & Co./ Trident	S. American ports. (Carting at Kalamboli for all).	8/1
			New York; Norfolk; Savannah; Baltimore; Boston; Charleston; Houston.	
29/12	Seacrest Achiever	Seaspeed	West African ports. (Carting at Hay Bunder No. 5).	6/1
2/1	Integra (V-04)	Arebee	Lagos; Apapa; P. Harcourt; Abidjan; Tema; Takoradi; Monrovia; Lome; Freetown; Cotonou; Douala; Matadi. (Carting M-Jetha C.D.).	6/1
6/1	Archimedes (Nhava Sheva)	Patvolk/ P & O/ S.W. & Co.	West African ports. (Carting at Kalamboli for all).	8/1

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
6/1	Archimedes (Nhava Sheva)	S.W. & Co./Trident/P & O	U.K. Cont. & U.S.A.
6/1	Kolya Myagotin	Transocean	F. East/USSR
4/1	Lanka Abhaya	Seahorse	U.K. Cont.
5/1	Maribor	Depe	Far East
8/1	Pioneer Zorka	Transocean	F. East/USSR
3/1	Scantro	Transworld	Cont.
3/1	Trident Endeavour	Sai Ship	S. America
8/1	Vishva Parimal	S.C.I.	U.K. Cont./US

Materials Imported

PLASTIC MATERIALS IMPORTED MADRAS (From 10.11.89 to 25.11.89)

HDPE: From Japan: Ganesh Agro Pack P. Ltd., 19,975 Kgs., Rs. 2,64,653; From Saudi Arabia: S.S. Laminates P. Ltd., 25.5 MTs., Rs. 3,32,532; From Singapore: Jtex Polyproducts, 17 MTs., Rs. 2,10,516; Kavitha Plastic Inds., 8.5 MTs., Rs. 1,06,525; Nartan Polymer P. Ltd., 17 MTs., Rs. 2,23,006; Rabbani Exports, 17 MTs., Rs. 2,10,516; Sivasakthi Polymers, 8.5 MTs., Rs. 1,06,525; S.S. Laminates P. Ltd., 8.5 MTs., Rs. 1,10,844; Vadera Plastics Enterprise, 68 MTs., Rs. 8,91,032.

LDPE: From Finland: Gurukar Plastics Ltd., 25 Kgs., Rs. 390; From Singapore: Rabbani Exports, 32 MTs., Rs. 3,09,926; Shri Lakshmi Narayana Plastics, 17 MTs., Rs. 2,41,841; From Korea: UB Mec Batteries Ltd., 33,000 Kgs., Rs. 3,68,859.

POLYPROPYLENE: From FRG: MM Rubber Co. Ltd., 2,000 Kgs., Rs. 1,68,424; From Netherlands: Polyspin Pvt. Ltd., 30,000 Kgs., Rs. 3,72,734; From Singapore: Super Packers, 15 MTs., Rs. 1,92,565; From USA: Narasimha Plastic India P. Ltd., 45 MTs., Rs. 5,63,310; Ultramarine Pigments Ltd., 30 MTs., Rs. 3,75,542.

POLYSTYRENE: From Korea: Integrated Exports, 51 MTs., Rs. 5,58,306; Universal Polychem, 408 MTs., Rs. 44,48,068.

PVC RESIN: From USA: Mercury Plastics, 34,000 Kgs., Rs. 4,33,742.

DRUG MATERIALS IMPORTED MADRAS (From 10.11.89 to 25.11.89)

AMPICILLIN SODIUM STERILE BP: From Hong Kong: TTK Chemicals Limited, 100 Kgs., Rs. 1,61,503.

ERYTHROMYCIN THIOCYANATE: From USA: Tamil Nadu Dadha Pharmaceuticals Limited, 999.55 Kgs., Rs. 12,34,201.

GRISEOFULVIN BP/USP: From Singapore: American Remedies Private Limited, 250 Kgs., Rs. 1,09,702.

MORPHOLINE: From USA: Standard Organics Limited, 15,060 Kgs., Rs. 5,86,616.

NORFLOXACIN: From Switzerland: Tamil Nadu Dadha Pharmaceuticals Limited, 200 Kgs., Rs. 4,44,455.

PENICILLIN G. POTASSIUM: From USA: Benzek Labs Ltd., 3,295.96 Kgs., Rs. 14,44,974.

PROPANTHELINE BROMIDE BP: From Denmark: Siri Pharma, 100 Kgs., Rs. 1,01,614.

MATERIALS EXPORTED MADRAS (From 15.10.89 to 21.10.89)

ALUMINIUM FLUORIDE: To Australia: T.N. Fluorine & Allied Chem Ltd., 12,000 Kgs., Rs. 22,30,550.

ETHAMBUTOL HCL BP 80: To Hamburg: Medchl Chem & Pharm. Pvt. Ltd., 1,000 Kgs., Rs. 4,82,976.

ZINC OXIDE: To USA: MMTC of India Ltd., 20,000 Kgs., Rs. 5,82,879.

MATERIALS IMPORTED MADRAS (From 26.11.89 to 30.11.89)

ACETONE: From China: Dolphin Drugs Pvt. Ltd., 12.8 MTs., Rs. 1,64,750; Priya Chemicals, 51.2 MTs., Rs. 6,59,000.

ACETONITRILE: From China: IDPL, 12,000 Kgs., Rs. 3,04,841; NOCIL, 12,000 Kgs., Rs. 3,04,842.

N-ACETYL SULPHANILYL CHLORIDE: From Japan: Eskayef Ltd., 37,750 Kgs., Rs. 20,13,857.

ALDEHYDE C: From Switzerland: Sri Balakrishna Perfumery Works, 100 Kgs., Rs. 23,013.

ALUMINA: From Japan: Elcera Substrates Ltd., 6,000 Kgs., Rs. 1,24,290.

ALPHA OLEFIN SULPHONATE: From France: Chemicals & Plastics India Ltd., 120 Kgs., Rs. 1,546.

AROMATIC CHEMICALS: From France: Gandhi Flour Mills & Perfumery, 150 Kgs., Rs. 32,637.

BARBITURIC ACID: From Switzerland: Babros Chemicals Pvt. Ltd., 400 Kgs., Rs. 62,662.

BUTYL ACRYLATE MONOMER: From Hong Kong: Bharat & Co., 7,020 Kgs., Rs. 1,52,011.

PARA CRESOL: From UK: Balmer Lawrie & Co. Ltd., 1 Kg., Rs. 31.

ETHYL ACETO ACETATE: From FRG: TTK Chemicals Ltd., 3,000 Kgs., Rs. 1,06,695.

GAMMA FERRIC OXIDE: From USA: Audio Electronic Co., 4,000 Lbs., Rs. 1,21,937.

ISOBUTYL BENZENE: From USA: Shasun Drugs, 13,657 Kgs., Rs. 7,70,144.

ISOPHTHALIC ACID: From Italy: Chemidye Mfg. Co. Pvt. Ltd., 17,500 Kgs., Rs. 2,77,110.

ISOPROPYL ALCOHOL: From China: Shasun Drugs, 38.4 MTs., Rs. 4,57,479.

LAB CHEMICALS: From USA: Kasturba Medical College, 29 Nos. Rs. 17,211.

LITHOPONE 30%: From FRG: Carborandum Universal Ltd., 10 MTs., Rs. 1,53,126.

MANGANESE OXIDE: From Belgium: Hilversun Electronics, 6 MTs., Rs. 2,98,746.

METHYL ACETO ACETATE: From USA: Siris Ltd., 30.672 MTs., Rs. 7,23,104.

MONOCHLORO ACETIC ACID: From FRG: Priya Chemicals, 33,000 Kgs., Rs. 6,42,707.

ORGANIC CHEMICALS: From Ireland: Nagarjuna Signode Ltd., 25 Nos., Rs. 3,356.

· D(-) PARA HYDROXY PHENYL GLYCINE: From Singapore: TTK Chemicals Ltd., 1,000 Kgs., Rs. 3,72,584.

MURIATE OF POTASH: From FRG: Indian Potash Ltd., 1,059 MTs., Rs. 25,50,559.

POTASSIUM PERMANGANATE: From UK: India Pistons Ltd., 16.8 Kgs., Rs. 14,100.

PROPYLENE GLYCOL USP: From Gandhi Flour Mills & Perfumery, 150 Kgs., Rs. 32,637.

SODIUM CHLORIDE: From USA: Kasturba Medical College, 29 Nos., Rs. 17,211.

TETRAHYDROFURAN: From Japan: Glindia Limited, 14,400 Kgs., Rs. 6,82,845.

XYLENE MIXED: From Netherlands: Addisons Paints & Chemical Ltd., 50.4 MTs., Rs. 4,51,377.

PLASTIC MATERIALS IMPORTED MADRAS (From 26.11.89 to 30.11.89)

HDPE: From Japan: Hindustan Cables Ltd., 16 MTs., Rs. 4,13,829; Navbharat Packagings Pvt. Ltd., 20 MTs., Rs. 2,83,185; From Singapore: R.N. Polysacks Pvt. Ltd., 17 MTs., Rs. 2,07,654; Integrated Exports, 17 MTs., Rs. 2,07,654.

LDPE: From Singapore; Rabbani Exports, 16 MTs., Rs. 1,90,272.

POLYPROPYLENE: From Netherlands: Polyspin Pvt. Ltd., 42 MTs., Rs. 5,21,773; From Singapore: Hindustan Plastics Pvt. Ltd., 16 MTs., Rs. 2,30,325.

POLYSTYRENE: From Korea: Punj Sons Pvt. Ltd., 12 MTs., Rs. 3,20,220.

STYRENE MONOMER: From FRG: Chemidye Mfg. Co. Pvt. Ltd., 17,200 Kgs., Rs. 2,67,989.

DRUG MATERIALS IMPORTED MADRAS (From 26.11.89 to 30.11.89)

CARBAMAZEPINE BP: From

FRG: Medispan Ltd., 100 Kgs., Rs. 1,14,007.

PENICILLIN G POTASSIUM: From USA: Benzek Labs Ltd., 3,302.04 MTs., Rs. 14,44,975.

MATERIALS IMPORTED BOMBAY (From 10.11.89 to 15.11.89)

ACRYLAMIDE: From Japan: J.M. Chemical Inds., 7.5 MTs., Rs. 1,90,734; K.K. Research Centre, 6,300 Kgs., Rs. 2,28,882; Mehra Chemicals, 1,000 Kgs., Rs. 25,431.

ACRYLIC ACID: From Japan: Goodlass Nerolac, NA, Rs. 2,777; Goodlass Nerolac, 1,600 Kgs., Rs. 55,540; From UAE: Vipul Dyes & Chemicals, 195 Kgs., Rs. 5,044.

ALBENDAZOLE: From China: Wockhardt Vet. Pvt. Ltd., 200 Kgs., Rs. 1,35,634.

ALDEHYDE C-8: From Japan: Oriental Aromatics, 320 Kgs., Rs. 37,976.

DL-2 AMINO BUTANOL: From FRG: Cadila Labs Ltd., 10,355 Kgs., Rs. 16,15,939.

2-AMINO 4-CHLORO PHENOL: From Japan: Sandoz Ltd., 2,000 Kgs., Rs. 4,43,419.

2-B ACID TECH.: From Korea: Sudarshan Chem Inds. Ltd., 2,000 Kgs., Rs. 1,76,324.

4-B ACID TECH.: From UK: Sudarshan Chem. Inds. Ltd., 2,923.5 Kgs., Rs. 3,96,867.

BUTYLATED HYDROXY ANISOLE: From Japan: Bombay Pharma Prod., 25 Kgs., Rs. 58,704.

CALCIUM CARBONATE: From China: Minerals Trading Co., 1,315 Kgs., Rs. 34,756.

3-CHLORO 4-FLUORO ANILINE: From UK: Samol Pharma Chem Pvt. Ltd., 250 Kgs., Rs. 96,102.

2-CYANO 4-NITRO ANILINE: From China: IDI Ltd., NA, Rs. 2,26,804.

CYCLOHEXYL ISOCYANATE: From FRG: Hoechst India Ltd., 80 Kgs., Rs. 1,73,616.

4,4 DIAMINO DIPHENYL METHANE: From Japan: Dr. Beck & Co. (I) Ltd., 14,000 Kgs., Rs. 7,31,063.

DICYANDIAMIDE: From FRG: Sterling Orgo & Inorgo Chemicals, 21,000 Kgs., Rs. 5,28,938.

DIETHYL CARBONATE: From France: Ranbaxy Labs Ltd., 7,920 Kgs., Rs. 3,84,926.

DIMETHYL FORMAMIDE: From Japan: IDPL, 532 Kgs., Rs. 1,19,891.

N-DODECYL MERCAPTAN: From FRG: PDI Chemicals Ltd., 100 Kgs., Rs. 17,611.

BETA HYDROXY ETHYL HYDRAZINE: From Netherlands: Kemwell Pvt. Ltd., 10,000 Kgs., Rs. 11,96,962.

GAMMA FERRIC OXIDE: The New Vinod Silk Mills Pvt. Ltd., 350 Kgs., Rs. 1,66,151.

GUAIACOL: From France: Synthokem, 5,000 Kgs., Rs. 4,87,432.

HYDROXYLAMINE SULPHATE: From Japan: Apte Amalgamation Ltd., 54 MTs., Rs. 14,18,980.

ISOPROPYL ALCOHOL: From Taiwan: Mihir Chemicals, 2,560 Kgs., Rs. 1,95,312.

LEVULINIC ACID: From Japan: Eskay Fine Chemicals, 500 Kgs., Rs. 94,943.

LITHOPONE: From China: K.K. Research Centre, 15 Kgs., Rs. 76,294; U.K. Paint Inds., 18 MTs., Rs. 1,22,388.

BIS-METHYL SILYL UREA: From FRG: Max India Ltd., 1,400 Kgs., Rs. 21,35,517.

N-METHYL CYCLOHEXYL-AMINE: From FRG: Profen Chemicals Pvt. Ltd., 340 Kgs., Rs. 28,729.

METHYL ISOBUTYL KETONE: From Taiwan: Bronze Chem Enterprises, 13,200 Kgs., Rs. 2,34,984.

MONOETHYLENE GLYCOL: From Saudi Arabia: Garware Plastic & Polyester, 19,440 Kgs., Rs. 37,90,268.

NAPHTHA SOLVENT: From FRG: Intec Polymers Pvt. Ltd., 28 MTs., Rs. 2,67,718.

D PARA HYDROXY PHENYL GLYCINE METHYL POTASSIUM: From Singapore: Gujarat Lyka Organics Ltd., 32.2 Kgs., Rs. 1,75,569.

GAMMA PICOLINE: From Japan: Pfizer Ltd., 1,017 Kgs., Rs. 5,12,184.

POLYVINYL CHLORIDE: From Brazil: Auto Plast, 50 MTs., Rs. 6,29,431.

POTASSIUM CARBONATE: From Japan: India Photographic Co. Ltd., 2,000 Kgs., Rs. 2,20,404.

POTASSIUM CARBONATE 99%: From Antartica: Hasmukhray & Co., 1,800 Kgs., Rs. 1,96,380.

PROPYLENE GLYCOL: From USA: Asian Paints (India) Ltd., 17,294 Kgs., Rs. 3,45,559; Mack Chem Corpn., 34,000 Kgs., Rs. 4,95,739.

SILICA GEL: From USA: SAIL, 240 Lbs., Rs. 97,145.

SODIUM LAURYL SULPHATE: From FRG: N. Arvind & Co., 1,100 Kgs., Rs. 3,57,185.

SORBIC ACID: From Japan: Bombay Pharma Products, 500 MTs., Rs. 52,609.

TETRAHYDROFURAN: From FRG: M.J. Exports Ltd., 4,186 Kgs., Rs. 2,15,943.

TITANIUM DIOXIDE: From Australia: ICI India Ltd., 20,030 Kgs., Rs. 9,15,524; From China: Inter Asian Chemical Inds., 12,000 Kgs., Rs. 3,30,604; Parsons Chemicals, 9,000 Kgs., Rs. 2,51,769; Usha Chemical Co., 9,000 Kgs., Rs. 2,51,769.

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TITANIUM TRICHLORIDE: From Japan: IPCL, 16.56 MTs., Rs. 22,23,998.

TRICHLORO ETHYLENE: From Japan: J. Kirit & Bros., 9,860 Kgs., Rs. 92,600.

TRIETHYL ORTHOFORMATE: From Japan: Ranbaxy Labs Ltd., 162 Kgs., Rs. 2,26,592.

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3,4,5 TRIMETHOXY BENZALDEHYDE: From Japan: Jupiter Org. (P) Ltd., 2,012 Kgs., Rs. 8,00,828.

TRIMETHYL PHOSPHATE: From USA: Sudarshan Chem Inds., 15,513 Kgs., Rs. 6,17,554.

VANILLIN USP: From USA: K. Sevantilal & Co., 250 Kgs., Rs. 58,454.

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FURAZOLIDONE: From Italy: Godamma Labs., Rs. 2,900 Kgs., Rs. 33,569.

BUTYLATED HYDROXY ANISOLE BP: From Japan: K. Sevantilal & Co., 240 Kgs., Rs. 62,128.

D PANTHENOL BP/USP: From Switzerland: Sarabhai Chemicals, 500 Kgs., Rs. 1,62,457.

TARTARIC ACID BP/USP: From Argentina; Cadila Labs Ltd., 18 MTs., Rs. 9,72,166.

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